THE

AMERICAN NATURALIST.

VOL. XX.—*SEPTEMBER*, 1886.—No. 9.

ANIMAL TRAITS.

BY I. LANCASTER.

AFTER convincing myself that the Lower Florida peninsula possessed the coveted facilities for prying into certain secrets of the birds which I was bent on having, a local habitation to serve as headquarters was decided upon. Between the extremes of forty and ninety degrees, temperature might be ignored, while wind, sun and rain were to be housed against; so that a high ceiling and a large room with a good roof, the whole being made of rough boards and shingles, was all that even lavish expenditure need provide. Glass was a useless luxury; windows were needed in plenty, however, and full half of the entire side walls was devoted to them. Two battens, the top one with gudgeons whittled on the ends, resting in an auger-hole in a block fastened to the walls, were nailed between two parallel joists in the vertical boarding, when, on sawing the top and bottom across, the window was complete. When pushed out at the lower end like an awning, the air and light were freely admitted, while the sun, rain and wind were sufficiently excluded. A stick below, resting against the sill to hold out the shutter, completed what I am disposed to consider the ideal South Florida window. A tide-water creek, very crooked and full of deep holes and narrow shallows, was near by, the pine forests falling off as the creek was approached, several acres of dense scrub growth intervening to the water's edge where I had located. The country in the vicinity was much broken—broken for Lower Florida. There were sandy swells as much as twenty feet high above tide-water, and gullies that one could not leap across, but otherwise all was a dead level so far as the ground was concerned. Matted jungles of tangled

vines and tough sinuous growths abounded, and although not lofty were nevertheless hard to penetrate. Small prairies of a few acres in extent were common, and ponds and saw-grass marshes were met with frequently. In the wet season the whole country was under water. In the dry, tide-water only was to be found. Of the wild animals native to these precincts, opossum and raccoon were everywhere; wild cats of powerful physique, magnified specimens of the domestic cat, although very rare, lived in the tangles and often wandered to the coast. Foxes of such exceeding beauty of shape and grace of motion that it seemed a crime to injure them, were met with at intervals, and bears, as fat as butter and as lazy as they had a right to be, in diminishing numbers, lived in the great hummocks. Rumor insisted that the cougar had its lair about the everglades, but in as extensive wanderings through as many "bogs, fens and briars," as ever fabled witch floundered over, I never found either the animal or its signs.

The United States, with that unbounded generosity so well known, gave to the State of Florida all "swamp lands." In a general way land covered with water would be termed "swamp," and if the examination occurred in August the whole country would fill this definition; if in January but a small fraction of it would be moist, and so the inferences can proceed with a good deal of certainty on the fact that the State owns practically all the land. It is not held at a high figure; one dollar per acre, grading down to fifty cents with the size of the purchase, will get an invulnerable title. The only drawback to the ownership of such land is, that one seems the poorer the more he has of it, still I purchased a small tract and felt as much like a landed proprietor as was possible under the circumstances of the case.

Not wishing to engage in agriculture to a greater extent than the satisfaction of curiosity demanded, about one-quarter of an acre was cleared and planted with various seeds, and a narrow pathway to the house, one hundred yards distant, was cut through the scrub.

The environment of the events following is now sufficiently detailed to suit the purpose in hand.

About a year previous to the house-building, on first arriving in the country, a hospitable cracker had presented me with a well-grown kitten in reward for unstinted praise of his splendid cats.

Puss grew apace, went boating and tramping with me, and developed to perfection the arts of agility for which the Felidæ are famous. It was a female, and was more than a match for any dog she ever met. Her assault was sudden; the back of the intruder was reached at a single leap, and its eyes made the objective of attack. Instantaneous panic ensued, and when the retreat became assured, she as quickly sprang into the bushes and instantly hid from sight. The dog, relieved of its foe and regaining its confidence, would often return, brim full of fury, to wreak vengeance, when it would be met as suddenly as before, with augmented intensity. Nothing but precipitate, howling flight seemed to suit the requirements of the case, and victorious puss would return with the most comically satisfied and important air. During her boating experience she learned to fish quite expertly. She would spring on her prey when it was near the surface of the water with unerring aim. She did not present an elegant appearance on reaching the shore or boat after a complete wetting, but she always brought out the fish, having no antipathy to the water and swimming like a duck. Alligators abounded in the creeks which I often navigated, and to puss they were perplexing objects. She strongly objected to their presence, but was undecided how to prevent it. I more than suspected that they would be her fate, as the scaly covering of the saurian would prevent her claws from securing a hold wherever placed, and should the jaws of the reptile once close upon her, her career would end at once. But I had underrated her resources. A rather small specimen came familiarly near our camp, and puss promenaded a log by the side of which the creature was slowly moving. After much preparation, which induced me to think "the female who deliberates is lost," she came furiously down, and as it appeared in the rush, with both fore feet in her victim's eyes. They were in an instant torn from their sockets, and we had a blind and frenzied alligator storming over our camp and through the bushes of the point, back and forth until it reached the water. There was a blunder somewhere, but the entire responsibility rested upon nature. In the water the saurian reigned supreme, but on land the clumsy thing could only see its foe as it lost its eyes. From a human standpoint it seemed a pity, but there was no discoverable cat ethics which would condemn the act, for puss at once proceeded to put herself through a course of gymnastics expressive of the utmost satisfaction.

When we were at length housed the kitten had fully matured, and the ancestral experiences registered in its nervous apparatus were supplemented, or at least confirmed, by many of its own. It took possession at once, explored every nook and corner, routed the mice, and proceeded to enjoy life.

One morning as I was digging a post-hole in the sand, a large snake made its appearance near by in the bushes. It remained through the day in sight, and seemed to be greatly interested in what was going on. The next day it was on hand and remained as before. It became more and more familiar, would approach to within a few feet of my person, examine each hole as it was dug, and interview the spade, stuck upright into the sand, by putting its head through the hand-hole and coiling and uncoiling about the handle. It seemed to invite companionship, and to regard me with intense curiosity as a unique specimen for investigation. It was non-venomous evidently, a *Natrix torquata* or *coluber* probably, but a native said, "hits a coachwip," and "coachwhip" it was from that time. It finally became a tenant-at-will, had the freedom of the house and grounds, and was an object of never-ceasing interest. Its curiosity was simply unbounded, and any hour of the day or night it was on hand to assist in whatever enterprise was in progress. When its acquaintance was first made I was interested in what puss would think of the new-comer. A contest was expected, but to my complete surprise neither snake nor cat took the least notice of each other. The cat was, however, mistress of the situation, for when coachwhip came too near it was boxed away, gently at first, with more and more claw in each succeeding tap until it obeyed. If the snake was hurt it at least simulated anger very closely, making sham onsets, gathering itself up as if to dart suddenly on its foe, quivering its head and oscillating to and fro in a forbidding manner. It was really of respectable dimensions, being ten feet long and over two inches in diameter in the thickest part, and when in these tantrums seemed formidable; but puss paid no attention to the fuss, shutting her eyes and sleeping in the midst of it all.

Two things the snake could never comprehend, a hot stove, and a student lamp. After a persistent investigation of these articles for nearly a year the mystery of neither seemed at all removed, and it was a trifle uncanny to look up from my book in the stillness of midnight and see the coluber's bright eyes, a foot above

the table, peering at the luminous shade, upon which, by the way a juggler and his snake were pictured.

Late one afternoon I answered bob-white's whistle by slipping cartridges of fine shot into the chambers of the gun, and proceeded to the clearing. There was found a large wild cat in possession, quietly sitting on its haunches on a sweet-potato hill. The longitudinal stripes and grim markings behind the ears were unmistakable, but no bars on the tail. It seemed a friendly beast, devoid of that look of wild ferocity characteristic of its tribe in more northern places, nevertheless had I been unarmed a foot-race would have been in order, but knowing that the unexpected might at any time happen, I never went about without some weapon of defense, and had entire confidence in small shot at close quarters. It made no motion of retreat as I advanced, but slowly opened its jaws and crouched as if gathering itself for a spring. Not desiring to injure it I backed away, only to be followed. This was not endurable, and having no wish to give it the least advantage, I killed it.

The next thing was to see what opinion the domestic cat would have of this distant relative, for I could not entertain the notion that they were cousins germane within the historic period, so arranging the carcass to appear as lifelike as possible, I induced puss to follow me to interview her dead congener. Alas! cat glory resembles human glory, and is liable to vanish at any time. Puss got within a few feet of the body before she saw it, and just as I was expecting to hear her inquiring "mew," there came instead a transformation which was indeed surprising. She suddenly grew to twice her natural size, her tail especially enlarged to the dimensions of an Indian war club. Her eyes seemed to be determined to leave their sockets, and she bounded into the air with a scream which until that moment I never heard issue from the throat of a cat. No sooner did she touch the ground than she went into the air again with a shriek, until the house was reached, and at the end of a week was hardly herself again. She was badly scared, but her fear had no paralyzing function, on the contrary it filled her with intense energy which reverberated through her nervous system for days afterwards. I could not think that the fact of the wild cat being dead was a factor in the other's terror, and some months after puss was confronted by a living one and all doubt on this head removed. Coachwhip interviewed the carcass

without the least trepidation, examined it critically, crawled over it in all directions, and went through its habitual pantomime for all unfamiliar things.

At times fish and wild game was provided in superabundance, and as the refuse went out of the window near the dining table, a depot of supplies for the animals of the immediate neighborhood was established. The scolding of opossums and raccoons was noticed, and at intervals the sharp bark of a fox was heard in the night hours, while every scrap of eatable stuff disappeared. Puss had often perched herself on the window-sill while this devouring of garbage was in progress, but seemed indifferent to what was going on. My approach, however guarded, occasioned the retreat of the animals, so that I could get no more than a glimpse of them. Remembering the dazzling effect of light at night on deer, I lowered the reservoir and burner of the lamp to the base, and holding it by the ring above, advanced to the window with entire success. Putting the lamp on the outside and leaning against the sill, a full view of the animals was had not more than six feet away. They seemed to think all was not right at first, but soon resumed their feeding and quarreling unconcerned. A brood of opossums, a couple of raccoons and a fox were on hand. The latter continued suspicious, gazing into my eyes for several seconds, but seemed convinced that there was no danger after the examination. So long as all movement was behind the light, everything was serene, but if the hand or a stick were advanced in front, panic at once seized the crowd. But where were the foxes' senses of smell and hearing? Were the olfactory and auditory nerves demoralized, as the optic seemed to be, by the ethereal vibrations from the incandescent body? One would think that at six feet distance at least the fox could smell its enemy in spite of the light. This kind of lamp-light scrutiny was of never-failing interest. The animals were fresh from the hand of nature and on their native heath. The opossums were particularly interesting; when several females with their broods were on hand, there occurred a mixing of families, for the mother which had secured a bone at once shook off her progeny while she ate it. Her discarded infants would fasten on the nearest female, and sometimes a single mother went about with four families of children hanging to her. When a fox appeared the encumbered animal at once took to the bushes, the others covering her retreat with

wide-open mouths which, with their serried rows of teeth, seemed indeed formidable. Reynard always respected this show of ivory, as the raccoons did also. But in spite of all the precautions taken by the mothers, a strict count of children after home was reached would show loss. When they were shaken off one would be a little late in regaining a position of safety, and in the hurry consequent on the fox's arrival, this tardy scrambler would prove to be the one not fitted to survive. It left no legacy to its descendants for it never had any. The celerity with which it was snapped up and carried off was commendable; a single squeak preluding a mingling of protoplasms.

This kind of observation went on through the rainy season to the following November, when the waters began to subside. The young opossums had escaped from maternal care and were their own masters, when one night a stranger arrived. The feeding company consisted of a huge opossum, several raccoons and a fox, when another wild cat, younger and smaller than the one killed, dropped from above into the center of the feeding ground, now worn quite bare. The fox sprang from the earth, barking with every jump, as it tore through the bushes in its frantic efforts to escape. The raccoons could be heard butting against the sleepers of the house in their lumbering flight, while poor puss went like a meteor through the opposite window, making a total wreck of the dining dishes, and did not appear at the house for several days. Opossum did not run; rearing backwards to an upright position, with wide-open mouth and such a disposition of its feet that its body seemed all claws, it held its ground with a snarling protest of intense anger. "The undaunted fiend what this might be, admired." Opossum presented no vulnerable point but down its throat, and it was unwise to assult in that direction. The cat got upon its feet and walked around raising its paw, but seeing no good place to strike. In fact no good place existed. The defense was vertical, and the assault made from a horizontal plane was alike bad from all directions. The beast in manœuvering for an attack got his tail within reach of my left hand, the right being engaged with the lamp; the temptation to seize it was irresistible. Calling out "puss I have you," as a firm hold was obtained, instantaneous panic ensued, and the fox's method and line of flight was closely followed. Had my grasp been as vigorous as that of Tam O'Shanter's witches, wild cat would have been transformed into lynx then and there.

Coachwhip was an interested spectator of the whole affair, and when it was over and the relieved opossum had shut its mouth, I thought the snake had gone insane. It tore around the room like lightning, tied itself into innumerable knots, wove in and out of the chair rounds, made sham charges, and ended by rushing out of the door and taking to the bushes.

Poor coachwhip met with a sad fate at last. One quiet day it had discovered a mouse in the yard hidden beside a billet of wood in a position so insecure that it took to the grass, and the snake lifted its head a couple of feet high to get a view of the escaping prey. A rush of wings and mingling of shadows took place, and Natrix went aloft in the talons of the king of birds. No time was to be lost. Shot was wanted, but only bullets were available. I emptied the full chamber of a Winchester rifle at the pirate, but every shot missed. The bird made directly for its nest that I knew of two miles away, but when the tree was reached, coachwhip had departed this life, and had no less than three living tombs.

It is evident that the great doctrine of the conservation and correlation of forces, as applied by evolution, has thrown a new and brilliant light upon these animal traits. They are no longer isolated facts, having their ultimate explanation in the specific characteristics of the creature, but legacies from ancestries reaching through the geological epochs to the earliest fossiliferous rocks. The force setting up the multitudinous motions is a product of the present time. The food digested, the air breathed, the various ethereal vibrations disturbing the nerves of sensation and all the influences which cause muscular work are active at the instant the work is done. The work done is done now. The forces employed are generated now. The transformation of force into nervous and muscular stimuli now takes place. But when and where was the character of the work to be performed decided? From whence came the order for its quantity, its intensity or its direction? Where did puss find her antagonism to a dog, her antipathy to an alligator, her friendly indifference to a snake, an opossum and a raccoon, and her mortal fear of a wild cat? Where did she learn that the well-detailed preparations for assault made by a serpent almost large enough to swallow her whole were sham before she had the least experience of it, while the silent body of one of her own family was the very maximum

of danger? Whence did she obtain the professional skill of an expert in disabling an armor-clad alligator the first time she tried?

Where was it decided that a wild cat should gaze complacently into the serried crater of a marsupial prepared for battle, and then fly in terror from a harmless touch of *Homo sapiens?*

'Twas instinct did it! Well, "instinct is a great matter," and would serve for the age of William Paley, who knew nothing about the conservation of forces, but science has added a new world to our possessions since then.

Think of it a moment. The ethereal undulations flowing from the surface of the snake, opossum and raccoon which enter the eyes of the cat and disturb its optic nerves, assisted, it is reasonable to suppose, by odors emanating from their bodies disturbing its olfactories, cause mild muscular action or none at all, while the slightly different modes of motion from a wild cat's body set up activities so intense as to suspend the action of other faculties and concentrate the whole force of the animal in changing the space relations between itself and its enemy. So violent is the disturbance that the sensation of hunger is suspended and several days are passed without food. Friends are no longer recognized. Everything manifesting motion is held a foe. A position as far away from the dreadful apparition as it was possible to find was held for three days, in a constrained attitude against the roof at the gable, with eyes phosphorescent at night and much dilated, and the unnatural tension was not for a moment relaxed at any time that she was observed.

We are driven to the conclusion that long ages had passed during which the ancestry respectively of the wild cat and the domestic cat were enemies, and that when collision occurred the domestic line went to the wall. During this time the present markings of the wild cat and its odor were acquired, pointing unmistakably to a long period of separation into species as distinct as we now find them to be. For it is very certain that puss never before saw a wild cat, nor is it very likely that her parents ever did. They are extremely rare in Florida, and nothing but long and frequent contact could arrange so vast a force about an equilibrium so delicate as to be overthrown by a mere arrangement of very ordinary reflections of light and trifling molecular disturbances of an odoriferous character.

A further matter forced itself upon my attention. Habit, from one point of view, stands in the same relation to truth that the spurious mother of the great Solomon's time did to the child of doubtful parentage. It seeks to divide it, ignoring the fact that to separate is to destroy it.

Familiarity with what is currently accepted had shut from me the vast oceans of truth that stretch illimitably on every side; and a sight of these wild creatures under circumstances which were not habitual, seemed to immeasurably enlarge the view of the relations which human life bears to the scheme of things. As night after night passed, I found myself unconsciously estimating the similarities and differences between myself and the weaker brethren. The first were innumerable, the last easily counted. Of the total sum of physical and mental activities in our several cases which we term "character," that of the weaker folks may be stated at ninety-nine-hundredths ancestrally derived, and one-one-hundreths individually derived. Of *Homo sapiens* say ninety-hundredths are ancestrally and ten-hundredths individually obtained. It really seemed that the only superiority I enjoyed over the others was a slight power of judgment on the ancestral derivations. But this power is extremely weak.

One evening I had noticed a splash of rain and noise of thunder at intervals for some hours until a lurid glare and crash came on the stillness with terrific effect. I never knew how it happened, but certainly when the awful racket was over I was on the floor under the table. Coachwhip was regarding me curiously from the back of a chair, and puss marched up with her inevitable mew. After a hearty laugh I had to admit that between my case and hers there was not one marvedi's choice. She took to the roof, I to the floor. I recovered from the panic sooner, but her position was more dignified. Her enemy was already dead, but I did not have one, the noise made by the passage of the electric force along a tree some three hundred yards distant being the sole cause of the trouble.

Property in money values is not the only thing we get from our ancestors. Our inheritances are found throughout the whole domain of intelligence, and it is in regard to these that I roughly blocked out a maxim which doubtless is subject to the weakness that it smacks of the backwoods. It is this: To rightly estimate the value of the ancestral legacies which compose our traits, is the height of wisdom.

NAVAJO NAMES FOR PLANTS.

BY DR. W. MATTHEWS, U.S.A.

THE plant-lore of the Navajo Indians compared with that of white men who are not specially versed in botany, is remarkable for its extent and accuracy. There are few species of phænogamous plants, among the varied flora of their country, for which they have not distinct, well-chosen names, and of whose physical properties they have not made some observation. True all do not possess such knowledge, and one is sometimes in danger of being deceived by the uninformed who will coin a name for the occasion rather than confess ignorance. This knowledge is, however, pretty well diffused, and there are many grades of proficiency in it. The better informed, in widely distant parts of the Navajo country, agree closely as to the names and properties of the great majority of species. My best informant was an old woman, probably over seventy years old. My next best informant was a very intelligent man of about thirty-five years of age. An old priest or so-called medicine-man, over sixty, who knew the Shamanistic rites and the elaborate mythology of the tribe perfectly, knew less of plant-lore than many others. It would seem that it is not the oft-quoted wise old medicine-man of the Indian tribe who knows the most of nature. I have heard from many Navajos of a wise man dwelling in the far north-western part of the Navajo country who knew most about the vegetable kingdom of all the Navajos. I regret that I never had an opportunity of meeting this man. He seems to be their highest authority in botany.

Not only do the Navajos discriminate all the more important species, but they are not devoid of generalization among allied species. In some cases this generalization agrees with our own. For instance, there are three species of juniper growing in the Zuñi mountains; each has its own appropriate name, yet the generic name for juniper (*koth*) appears in all. The most common kind of sunflower bears the name of *indigili;* as with ourselves, this is taken as a type or foundation species of plants in the subtribe Helianthеæ, and we have *indigili nilchini*, strong-scented sunflower (*Verbesina enceloides*), and *indigili nilchinitso*, great strong-scented sunflower (*Helianthus nuttallii*).

Of a class of plants so rank and showy as the sunflower

family, it is easy to credit this; but it is more difficult to realize that in the obscurely flowered and unattractive Chenopodiaceæ and Amaranthaceæ their faculties of observation have guided them as safely. In the section of the Navajo country where I did most of my collecting there are two species of Chenopodium so much alike that white people in general do not distinguish them from one another but call them all "lamb's quarter." There is still another so little like its congeners in its macroscopic characters that none, I imagine, but the scientific could trace the relationship; this is the *Chenopodium*, or *Teloxys cornutum;* when burned it emits a fine aromatic odor, and in the late autumn it changes to a rich rose-lake color which lends a beautiful tint to the slopes of the Zuñi mountains. Again the relationship between the goosefoot and amaranth families is not known to the unscientific among ourselves. That the Navajos have traced some character in common, in these instances, is evident from the following names:

Chenopodium fremontii, *tlotáhi.*

Chenopodium album, *tlotáhi-tso*, or "great *tlotáhi.*"

Teloxys cornutum, *tsinya tlotáhi*, or "*tlotáhi* under the trees," from its sub-arboreal habitat.

Amaranthus retroflexus, *tlotáhi-hochi*, or "prickly *tlotáhi.*"

They do not however apply the name *tlotáhi* to all the Chenopodiaceæ, but they evidently connect the not very similar genera of Atriplex and Sarcobatus, the former being called *togoji*, referring to its spines, and the latter *togojijin*, or "black *togoji.*"

They are not always thus happy with their classification, for *Silene lacinata* and *Castilleia affinis*, representing the widely separated families Caryophillaceæ and Scrophulariaceæ are both called *táhitihita*, "humming-birds' corn," because humming-birds are often seen hovering over them. The Indians do not suppose them to be the same plant, but will tell you they are different kinds though named alike. The term *chil-epe*, "milk-plant," is sometimes applied to representatives of both Euphorbiaceæ and Asclepiadaceæ.

It would occupy too much space to recount all the facts concerning the properties of plants which I obtained from them, but I will narrate two instances:

Comandra pallida is a small low plant of obscure appearance; it is rare in the Navajo country, and grows on the mountains

among grasses and underbrush which almost hide it from sight. The unpracticed eye might pass by specimens of this plant a hundred times without observing them. I once took some of this Comandra to the man whom I have described as my second-best informant, yet doubting whether he knew anything of such a rare and, to me, useless plant. Without taking it into his hand or honoring it with more than a glance, he named it. I expressed some doubts. He replied, "I know it well. It has a blue root." Feeling now positive he was mistaken, I exhibited the root, which was a distinct white. Without answering he took the specimen out of my hand, scraped the root with his thumb nail, handed it back to me and told me to observe it for a moment. To my surprise the denuded root changed from white to a delicate cerulean tint.

On another occasion I met the same Indian carrying, in the fold of his blanket, some specimens of *Pectis angustifolia*, a plant which on the dry mesas of New Mexico does not attain a height of more than two or three inches, but it has a delightful odor, like that of lemon verbena, and its infusion is used by the Navajos as a carminative. Their attention has therefore been drawn to it. The name given for the plant was so peculiar, signifying "a breeze blowing through a rock," *tseganilchee*, that I made no delay in getting an explanation from him. He led me to the top of a desert mesa where the plant grew fresh. Here he picked up a piece of sandstone about a foot square and three inches thick, and held it up to my nose, saying, "Do you smell anything on that stone?" The dry hard stone was of course inodorous. He then rubbed a little of the fragrant Pectis on one of the broad surfaces of the stone and immediately applied the opposite surface to my nostrils. The agreeable odor was at once distinctly perceptible through the rock. Some minutes later it could be detected in all parts of the fragment; but at first it was perceived at a point directly opposite to the point of application. Later he performed the experiment on a large stone nearly two feet thick; the results were the same as with the smaller stone, but more time was required for the odor to penetrate the sandstone. The odor, he said, went through the rock as if it were blown by a breeze, hence the name. It is possible similar results might be obtained with other odoriferous substances.

Many plants are named from supposed medicinal virtues,

others from the animals which they seem to attract or furnish food for, others from fancied resemblances. The following list of some of the more important plants will show their different modes of devising names:

Order RANUNCULACEÆ.

Delphinium scaposum Greene, *tha'-di'-thee-do-tlij'*, "blue sacred powder." The powdered petals are used by the Shamans as a sacrifice to the gods of the south. Blue is the color sacred to the south in Navajo rites.

Order BERBERIDACEÆ.

Berberis fremontii Torrey and Gray, *kin-li-tso'-ee-tso*, "large yellow twigs." Used in dyeing buckskin yellow. "Great *kin-litsoee*," see *Berberis repens.*

Berberis repens Lindley, *kin-li-tso-ee*, "yellow twigs." The wood is yellow.

Order CRUCIFERÆ.

Draba montana Watson, *a-lij-be-i-tsol.* The name refers to its supposed diuretic properties.

Arabis holböllii Hornemann, *a-zay'-la-dil-tay'-hay*, "scattered," or "lone medicine." The plants grow singly and at a distance from one another, not in beds or clusters.

Thelypodium wrightii Gray, *nan-chath'-a-zay'*, "medicine for swellings."

Stanleya pinnatifida Nuttall, *tseh'-chosh-a-zay*, "medicine for the *rock-worm*," *i. e.*, a glandular swelling.

Physaria newberryi Gray, *cheesh-a-zay*, "sneeze medicine." Used as a snuff in catarrh.

Order CARYOPHYLLACEÆ.

Cerastium arvense Linnæus, *tho-ka'-so-kath*, "it stands in water," *i. e.*, it grows in moist places.

Arenaria aculeata, *a-zay-tlo-ee*, "medicine hay."

Order MALNACEÆ.

Malvastrum coccineum Gray, *a-zay-in-klin'-i*, "gummy or glutinous medicine." The infusion is a supposed remedy for diseases produced by witchcraft.

Sphæralcea fendleri Gray, *a-zay-in-klini-tso. Tso* signifies "large," see *Malvastrum coccineum.* These two plants are much alike in appearance.

Order LINACEÆ.

Linum rigidum Pursh, *la-tha'-di-chol*, "round top," refers to shape of capsules.

Order RHAMNACEÆ.

Ceanothus fendleri Gray, *peen'-bi'-tha*, "deer's food," or "deer's corn." It is said that the deer browse on it.

Order VITACEÆ.

Ampelopsis quinquefolia Michaux, *chil-na'-tlo-i*, "plant that weaves," *i. e.*, climbs. The name is, however, by some applied to other vines. *Tla-ash-tla*, "five-leaf," is another name.

Order ANACARDIACEÆ.

Rhus aromatica Aiton, var. *trilobata* Gray, *chil-chi'-ni*, or *chil-chin'*, "odorous plant." Some say the name should be pronounced *chee-li-jin'*, which would mean "dark red," also an appropriate name. Sometimes it is called *kin*, "the twig," because its twigs are those most used in making baskets. The acid fruit is eaten.

Order LEGUMINOSÆ.

Sophora sericea Nuttall, *de-pay-hi-chi'-di*, "sheep scratch." It is said that sheep paw the ground to get at the roots. This name is also applied to some species of Astragalus.

Lupinus brevicaulis Watson, *a-zay-ba-ad'*, "female medicine." The name and probably the use were suggested by the peculiar appearance of the pod. It is supposed, when eaten, to be a remedy for barrenness, and to specially favor the production of female offspring.

Trifolium involucratum Wildenow, *cha'-in-tsi-li*, "transparent ear." Named from the appearance of the leaf.

Hosackia nana Watson, *neeh'-bist-yah*, "lies on the ground," so called because procumbent. It is also a *cheeshazay*, or catarrh remedy. See *Physaria newberryii*.

Psoralea tenuifolia Pursh, *leen-tha'-tsoz*, "slender horse corn."

Petalostemon candidus Nuttall, var. *occidentalis*, *has-thu'-i-bit-see-gale'*, "old man's queue," which the dense terminal white spike is supposed to resemble.

Glycyrrhiza lepidota Nuttall, *el-than'-ee-tsee-hee-tsoz*. *Tsoz* means "slender," see Xanthium. The pods are armed with hooked adherent prickles.

Astragalus matthewsii Watson, *a-zay-ba-adi-tso.* *Tso* signifies "great," see *Lupinus brevicaulis*, ante.

Astragalus triflorus Gray, *tha-hol-cho'-shee*, "popping leaf." Children burst the inflated pods on their foreheads.

Astragalus kentrophyta Gray, *ma-ee-nah'-ol-chil*, "coyote bean plant," or "wolf bean plant." A reputed remedy for rabies. The name is applied also to other species of Astragalus to which similar properties are attributed.

Lathyrus polymorphus Nuttall, *na-ol-il-tha'-he*, "bean-like leaf."

Order ROSACEÆ.

Cercocarpus parvifolius Nuttali, *tseh-es-thaz'-ee*, "heavy as a stone." The compact fine-grained wood, particularly that of the root, of this species of "mountain mahogany" has a high specific gravity.

Cowania mexicana Don, *a-way-tsal*, "baby's bed." The soft shredded bark of the "cliff-rose" is used to line the baby basket.

Findlera rupicola, *tsin-tliz'-i*, "hard wood." The wood is not hard when green, but is said to become so when seasoned, and is then used for arrows, weaving-forks and other articles requiring a hard wood.

Amelanchier alnifolia Nuttall, *dit-say-di-to'-dee*, "soft cherries." The cherry is called *ditsay*, a name for which I can discover no satisfactory derivation. The service berry is regarded by the Navajos as a variety of the cherry, or allied to the latter.

Order SAXIFRAGACEÆ.

Tellima tenella Watson, *tseh'-tha-sa-ka-dee*, "growing upright among rocks."

Order ONAGRACEÆ.

Epilobium coloratum Muhlenberg, *chil-a-tha'-eth-sos*, "feather-topped plant." Name refers to the plumes of the seeds showing through the open pod.

Œnothera breviflora Torrey and Gray, *klay-ee-kaw'-hee*, "night blooming." The flowers unfold after sunset.

Gaura parviflora Douglas, *a-zay'-sa-kaz'-i*, "cold medicine." The infusion is supposed to allay inflammation and cure burns.

Order CACTACEÆ.

Cereus phœnicius Engelmann, *ja-ee-na-i-o-kis'-ee*, "twisted

heart," so-called probably from the shape of this contorted cactus; but they say the fruit is poisonous and makes you feel as if your heart were twisted.

Opuntia missouriensis De Candolle, *hosh-int-yay'-lee*, "broad-thorny."

Order LOASASEÆ.

Mentzelia multiflora Il-klee'-hee, "tenacious." The leaves stick obstinately to the clothing.

Order UMBELLIFERÆ.

Cymopterus purpureus Watson, *ha-zah'-lit-so*, "yellow-flavor." It is used as a pot-herb in seasoning mush and soup.

Order COMPOSITÆ.

Eupatorium purpureum Linnæus, *kas-thaw'-bay-kaw*, "antidote for arrow poison."

Eupatorium occidentalis Hooker, *bil-haz-chee*, "odorous in the wind."

Gutierrezia euthamiæ Torrey and Gray, *chil-dil-gez'-ee*, "frightened weed." It is difficult to say why this name was given.

Bigelovia graveolens Gray, *kil-tso-i*, "yellow-stem." Used to dye wool yellow.

Aster multiflorus Linnæus, *nath-iz'-ee-ha-naz'-ee*, "eyelashes." Name suggested by the circle of fine rays.

Thelesperma gracile Gray, *wo'-tsin-i-a-zay*, "tooth medicine." Said to be good for the teeth, but in what way I did not learn. It is a nervous stimulant, and its decoction is used as a beverage by the Indians and Mexicans. The latter call it "*te de los Navajos*," or Navajo tea.

Xanthium strumarium Linnæus, *el-than'-ee-tsee-hee*, "sticking to one another." An appropriate name for the well-known cocklebur or clotbur.

Sanvitalia aberti Gray, *a-zay'-ho-tsee-hee*, "benumbing medicine." When chewed it has a salty pungent taste, which is followed by a sense of numbness in the mouth; said to be diaphoretic.

Achillea millefolium Linn., *ha-zay-il-tsay*, "squirrel's tail." Named from the shape of the leaves.

Artemesia trifida Wildenow, *tho-ee-kal'*, "water bearer." In the dry climates where it grows it is said to collect dew more readily than any other plant.

Senecio douglassii De Candolle, *hosh-bel-tay'-hee*, "cactus brush." The tops are used as brooms to brush the spines from cactus fruit.

Order LOBELIACEÆ.

Lobelia splendens Humboldt, Bonpland and Kunth, *tha-hee-thee'-hee il-tha'-hee*, "humming-bird's wing," which it is fancied to resemble.

Order OLEACEÆ.

Forestiera neo-mexicana Gray, *ma-i-tha'*, "coyote's corn." The bear is said to eat the fruit of this tree as well as the coyote.

Order ASCLEPIADACEÆ.

Asclepias verticillata Linnæus, *klish'-bi-tay-il-tzoz'*, "slender snake-horn." The pod has some resemblance to the horn of a rattlesnake (*Crotalus cerastes*). I imagine some Asclepias of stouter habit is called *klish-bitay*, or "snake-horn."

Asclepidora decumbens Gray, *chad-il-tay*, "antelope horn." Named from shape of pod.

The Asclepiads in general are often called *chil-a-pay*, or "milk weeds."

Order GENTIANACEÆ.

Gentiana affinis Gissel, *in-iz'-ee-chil*, "witch plant." Supposed to be an antidote for witchcraft.

Frazera speciosa Douglas, *peen-il-cha'-hee* "deer's ear." The large obovate downy root-leaf has much resemblance to a deer's ear.

Order HYDROPHYLLACEÆ.

Phacelia glandulosa Nuttall, var. *neo-mexicana*, *a-zay'-in-chee-hee*, "angry medicine." It is said to inflame the skin.

Phacelia integrifolia Torrey, var. *palmeri* Gray, *a-zay'-in-chee'-hee-tso*. *Tso* means "big" (see *Phacelia glandulosa* ante).

Order BORRAGINACEÆ.

Lithospermum angustifolium Michaux, *a-zay'-ha-chee'-nee*, "red-body medicine." There is a myth, accounting for the redness of the root, saying it is derived from the blood of a magician or holy one who was killed by lightning.

Lithospermum multiflorum Torrey, *a-zay'-ha-chee'-ni-tso*, "great red body medicine" (see *L. angustifolium* ante).

Order SOLANACEÆ.

Solanum tuberosum Linnæus, *nim'-as*, "anything globular; a ball." The potato grows wild in New Mexico.

Lycium pallidum Miers, *has-chay'-tha*, "the food of" a demi-god or genius named "*Has-chay*," a name derived from their mythology. The edible fruit is sacrificed to this god.

Order OROBANCHACEÆ.

Aphyllon multiflorum Gray, *hleh'-do-lej*, "feet stuck in the ground." The plant at the root has somewhat the appearance of a moccasined foot sunk partly in the earth.

Order LABIATÆ.

Salvia lanceolata Wildenow, *chal-tha'*, "frog's corn."

Monarda fistulosa Linnæus, *a-zay-in-do-tej'-ee*, "medicine tied at intervals." The name refers to the whorls.

Order NYCTAGINEÆ.

Abronia cycloptera Gray, *kin-tlish'-ee-tha*, "food or corn of" coleopterous insect named "*kintlish*."

Order POLYGONACEÆ.

Eriogonum elatum Douglas, *hleh-a-zay*, "earth medicine." I have not discovered why this name is given.

Eriogonum fasciculatum Bentham, *bis-in-dis-chee'*, "red (clusters or tufts) scattered on a bank;" thus it grows.

Eriogonum microthecum Nuttall, *bisindischee'-baäd* "female *bis-indischee*." This species is regarded as the female of the former (*E. fasciculatum*) because more slender.

Eriogonum racemosum Nuttall, *nee-gan'-thee-hee*, "runs through the earth," *i. e.*, the long tap-root runs.

Eriogonum jamesii Bentham, *bil-na'-tho-i*, "with tobacco." The leaves are mixed with tobacco in smoking.

Order AMARANTACEÆ.

Amarantus blitoides Watson, *nas-ka'-di*, "lying on the ground," referring to the prostrate or decumbent stems.

Order CHENOPODIACEÆ.

Eurotia lanata Moquin, *kat-so-tha'*, "jack rabbit's corn."

Order EUPHORBIACEÆ.

Euphorbia pringlei Engelmann, *kay-tsee-hal-chee'*, "red near the feet." The stem is red at the base.

Order SALICACEÆ.

Populus fremonti Watson, *thiss.* Etymology unknown. Cottonwood.

Populus angustifolia James, *thiss-tsoz.* Slender cottonwood.

Order CUPULIFERÆ.

Quercus undulata Torrey, var. *gambelli* Engelmann, *tseh-chel* or *chet-chel*, probably "rock plant." This oak is most common in rocky land, and is very hard.

Quercus undulata var. *pungens* Engelmann, *tseh-chel-inklizi-* "hard rock plant," or "hard oak."

Quercus undulata var. *brevifolia* Engelmann, *tseh-chel-inglizi'*, *baka. Baka* means "male." This variety is spoken of as the male of the last because more robust and spiny.

Order LORANTHACEÆ.

Phoradendron juniperum Engelmann, *dah-tsa'*, "a basket on high." This parasite has some resemblance to a basket placed in the branches of a tree.

Order CONIFERÆ.

Juniperus virginiana Linnæus, *kat-nee-ay-li*, "strained juniper." Its long pendulous branchlets (very long and slender in this region) look like material pouring from a strainer. *Kat* is the *Juniperus communis* Linnæus.

Juniperus pachyphlœa Torrey, *kat-dil-tah'-li*, "cracked juniper." Its bark presents a cracked or broken surface like that of white-oak, and very unlike that of other junipers.

Order LILIACEÆ.

Allium palmeri Watson, *tlo-chee'-nee*, "strong-smelling grass." This name is generic for all onions and garlics. Cultivated onions are called *tlo-chee-nee-tso*, or "big onions."

Allium cernuum Rothrock, *tlo-cheen'-lit-chee'*, "red onion."

Yucca baccata Torrey has two names, viz., *hosh-kawn*, "sweet-thorny," which alludes to its pleasant fruit and sharp-pointed leaves; and *tsa'-si*, which seems to be a generic name, and whose derivation I know not.

Yucca whipplei (?) Torrey, *yay'-bi-tsa-si*, "Yucca of the gods," a name derived from their mythology.

Yucca angustifolia Pursh, *tsa'-si-tsoz*, "slender Yucca."

Calochortus nuttalli Torrey, *al-tsee'-nee-tha'-i*, "children's food or corn." Children eat the bulb.

Order GRAMINEÆ.

Sporobolus cuspidatus, *bay'-ee-jo*, "an instrument to comb or brush the hair." The Indians of the Southwest make brushes from this grass.

Sporobolus crytandrus Gray, *tloh-tsoz'-ee*, "slender hay."

Oryzopsis cuspidata Bentham, *in-dit-lith'-ee*, "burnt off or burnt free." The name refers to the persistent chaff which can only be removed by roasting when the edible seeds are cleaned.

Bouteloua hirsuta Lagasca, *tloh-nas-tas'-ee*, "bending hay." the racemes are curved almost to a semicircle.

Poa andina Nuttall, *tsin-ya-tloh'*, "hay under the trees." In the Navajo country the habitat of this grass is usually subarboreal.

Phragmites communis Linnæus, *tloh-kah'*, "arrow-hay." The culms were formerly used for arrow-shafts.

Hordeum jubatum Linnæus, *ha-zay'-il-go-ee*, "runs down the throat." A spikelet once in the mouth is with difficulty ejected, it tends to go further down. It is usually necessary to pull it out with the fingers.

In addition to the above there are many names for which no satisfactory etymology can be found.

——:o:——

CROW ROOSTS AND ROOSTING CROWS.

BY SAMUEL N. RHOADS.

(*Continued from p. 701, August Number.*)

THE nearest roost to Bristol, now existing in the State of Pennsylvania, of which I am able to get account, is situate in Montgomery county, on the farm of Alfred Moore, and near the post-hamlet of Davis' Grove. This gentleman informs me that they (the crows) first came to his place in the winter of 1878, from Camp Hill, in the same county, which locality he remembers to have been their rendezvous for twenty-five years. The present roost covers about twenty acres. Careful average estimates of the number of birds commonly roosting per acre show the maximum to be about ten thousand. Therefore, although

my correspondent playfully hints of there being "millions in it," we may more safely place the number of crows resorting to his farm at night within two hundred thousand.

Were we to accept as proven that the so-called Bristol roost, of which Godman speaks in 1830 as having contained a million crows, was situate on the west bank of the Delaware, it might be fair to assume that these two hundred thousand represent, at the present day, that mighty host of ancestors. However welcome such intelligence would be to many crow haters, it would be unfair to infer that the proportion of crows living at present to the number living fifty years ago is as one to five.

The experience of older residents of the country justifies the belief that great diminution has been made among the myriads and probably a census would show that the crow population of to-day is to that of 1830 as one to two. When we take a broad view of this, it is easy to predict that, despite the increasing cunning and wariness of the nineteenth century crow, he must either totally renounce his partiality for the haunts of men, or speedily become extinct. As this trait seems inextinguishable in the bird, mankind should seriously determine the economic relations of crows to men ere too late. This is fully worthy the impartial investigations of the American Ornithologists' Union, and we may well rejoice to see that the cause of an unjustly persecuted bird is no longer left to the tender mercies of interested farmers, indiscriminate gunners, and uninformed legislators. In investigating this subject, I am led to think that very large roosts are nowadays less popular than formerly, or, in other words, that roosts have increased in numbers as the crows have diminished.

By sad experience they have found that unlimited union is weakness rather than strength, and have divided into smaller and more numerous companies, each having its favorite and separate locality, to which every member shows inviolate attachment during winter.

I am unable to discover that any roost exists in Pennsylvania, other than the one just mentioned, on the farm of Alfred Moore.

This is inexplicable, as the conditions of this place no better answer the requirements of a roosting crow than numberless other places in the neighboring counties. It goes to prove that a crow must inherit an attachment to localities even unto the last generation, nay, even unto death.

What bird more justly merits the blessing of long life, if we reward him according to his way of honoring father and mother by cleaving to the unaccountable eccentricities which seem so out of the common order of corvine habits and customs?

In this respect the Pea Patch and Reedy island roosts are parallel instances.

Though my *personal* experience is confined to the roosts of New Jersey, outside information supports the conclusion that more crows pass the winter nights in that State than in all the rest of the Union taken together, and a few months careful examination has shown that in the counties of Camden and Burlington nearly every tract, ten miles square, contains one of their dormitories; also, that in the western half of Burlington county, which would include four such tracts, there are at least seven localities known to the writer as being the resort of from one to three hundred thousand crows nightly.

A more thorough canvass of the subject would undoubtedly reveal three or four more such places yet unheard of with accuracy sufficient to justify a present enumeration in the roosts of Burlington county. A list of those roosts which have come under notice will be given at the end of this paper. Roosting places, in proportion to their immunity from invasion, are used year after year, and probably before the settlement of our middle districts many of them were centuries old. That one in Maryland of which Godman speaks as being so ancient that the droppings had accumulated to the depth of several feet, and the fermentation of which he supposed sufficient to contribute to the warmth of the roost, is unparalleled by the crow dormitories of to-day. It seems hardly credible that such a store of guano should have long existed among Southern agriculturists, nor can we believe that the native pines of Maryland, indigenous to a thin, infertile soil, could have borne such high-grade fertilizing. For the sake of consistency we may cut down "feet" to inches in order to save the trees, nor do we think it either possible or necessary that a crow warm his bed-chamber in such a manner as our worthy author suggests.

So universal has been the persecution of these birds at night, we will not be able to find among the many roosts now in use more than half of them of ten years' standing. This necessity for quitting old-established resorts has taught the wary birds a les-

son, for in their struggle for self-preservation they have renounced the sheltered retreats of pine forests and when forced to seek another refuge invariably select higher ground and deciduous woods, preferring to perch on the topmost twigs of bare and leafless branches, and brave thus the rigors of a winter's night than court destruction among the dense pines, whose darkling shade conceals the movements of their arch enemy. The partial migration of crows to the vicinity of Philadelphia from North and West leaves a few individuals to winter in New England and some of the Western States, but their numbers are, comparatively speaking, so insignificant that their roosting places have not been noticed by ordinary observers. I received word from William Brewster, of Cambridge, that, while he has no personal knowledge of roosts in New England, "a taxidermist in Brookline (near Boston) told (him) years ago that there was a roost somewhere near his house to which several hundred resorted every night through the winter."

A foot-note in Wilson's account of *Corvus americanus* refers incidentally to a similar place in New York State. It reads thus: "A few years ago," says an obliging correspondent, "I resided on the banks of the Hudson, about seven miles from the City of New York. Not far from the place of my residence was a pretty thick wood or swamp, in which great numbers of crows who used to cross the river from the opposite shore were accustomed to roost." Of Maryland we have already heard through Dr. Godman. H. W. Henshaw has kindly furnished me with valuable additional information respecting a roost near Washington, D. C., "between the Aqueduct bridge, just above Georgetown, and the Chain bridge, some three miles from the latter."

In the "high, deciduous trees of Arlington cemetery" is another favorite resort, and the same gentleman adds that one of these roosts includes about eight to ten acres of woodland, chiefly composed of deciduous trees. We may conclude that, since Godman's day, Maryland crows have forsaken the pines of the Chesapeake region, and, like their New Jersey brethren, chosen a more stormy perch among the bare branches of deciduous forests. My informant estimates the number of crows wintering about Washington at near forty thousand, stating that, "in the opinion of many, the number is much greater, and I think I have seen statements in the newspapers running up into the hundreds

of thousands." The Washington crows derive most of their food from the immediate vicinity of the Potomac, either on shore or from the numerous flats and bars within the river, both north and south of the Capital as well as from the eastern branch as far up as Bladensburg.

Thus is formed two distinct morning flights from Arlington, the one going southward beyond Alexandria, and the other, which attracts most notice from Washingtonians, passing over the city toward the east branch.

This roost has been known to my correspondent since his residence in the District of Columbia (fourteen years), but in his opinion the crows must have made many changes in their choice of a resting place during the late war on account of the wholesale destruction of timber in that vicinity, and former roosting places were probably abandoned on all sides during the period of devastation.

That similar places to those already mentioned exist shorewise in the States of Maryland and Virginia is not yet proven, but we may feel assured from our knowledge of the abundance of both species of crow in these parts, that inquiry will reveal their existence. From what we know with certainty, facts tend to show that as we go northward, southward or westward of our City of Brotherly Love in the winter season, the number of crows rapidly diminishes. The Washington roost differs from those located further north, in the fact that the fish-crow, *Corvus ossifragus*, resorts thither in common with *C. americanus*. The proportion of fish-crows to the latter is as one to five, and although the species do not at other times consort together, there appears to be no attempt on the part of either kind to keep aloof from the general movements of the body-gregarious during the nightly gathering, but the admixture of the two species is uniform throughout the flock and harmony is a law recognized by them as it is among the several species of communistic black-birds.

My friend's experience herein differs decidedly from that of both Audubon and Wilson.

The words of the former naturalist have been already quoted,[1] and Wilson in his account of the fish-crow mentions particularly that they retire to high, interior forests, whereas the commoner species generally roosted along water-courses among the reeds.

[1] See p. 693, August number.

Shall we infer from this that the relations existing between our two eastern crows have so materially altered in the last eighty years, or shall we consider that the two great pioneers of American ornithology were not well informed?

Possibly the "misery" of nineteenth-century crows "loves company," which eighteenth-century crows were too aristocratic to keep.

With rare exceptions, such places as are referred to by the afore-mentioned authors as the usual roosts of *Corvus americanus* in former times are nowadays unfrequented. Is it possible that the extensive roosts of Central New Jersey were not so used a hundred years ago? At present the majority of roosting crows do fly far into the interior to pass the night, though it cannot be denied that preference is nearly always shown to the vicinity of some water-course.

It is possible that neither Audubon or Wilson had knowledge from personal observation of any roosting place of *C. americanus* far enough south to include the winter range of *C. ossifragus*.

A visit to one of the numerous roosts of New Jersey would repay any one interested in nature and reward the curiosity of the most casual observer.

The course adopted in assembling to and departing from the chosen spot is uniform everywhere. About an hour before sunset stragglers begin to appear, reconnoitering as it were to see that the coast is clear, and returning whence they came as if to inform the main body of the result. In the course of half an hour the flocks begin to arrive in broken lines and detachments from all quarters, and, if the evening be calm, their earthward descent from a height of many hundred feet exhibits aërial prowess surpassing in daring elegance those of any other land bird with which I am acquainted.

It is their invariable custom to descend to some spot in the neighborhood from one-half to a quarter mile from the roost, preliminary to assembling there for the night's repose. This may be either upon the adjoining fields or on woodland tracts near by. Such preliminary gatherings, as Godman observes, seem to have a definite object—either for toilet or gastronomic purposes—a time, also, if we may judge by their clamor, of general conversation, some rejoicing, some repining in their varied experience of the last twelve hours.

The aërial evolutions of this descending multitude, coupled with the surging clamor of those which have already settled as successive reinforcements appear, and which at a distance greatly resembles the far-away roar of the sea, may justly awaken emotions of sublimity in the spectator. To descend almost perpendicularly from a height one thousand feet above earth to the very tree-tops and then to glide above them on half-closed wings with a resultant momentum that is almost startling in its arrowy velocity, is a favorite manœuver, and when two such playfellows pursue each other in this headlong swoop their turnings and twistings and doubling contortions amaze the beholder. It reminds one of lightning in feathers, but the results are surprisingly harmless, and it may better be compared to a shower of day meteors whose "radiant point" lies somewhere in East Pennsylvania. Until sunset this novel scene continues without interruption, whilst field and forest in the vicinity of their great dormitories are shrouded by the thousands which have alighted, and, were it not for their deafening clamor, the living pall which overspreads the scene might well suggest a land of mourning and death. When they settle on the ground on such occasions they resemble gulls on a sand-bar, each standing motionless with its head toward the breeze. The whole thing seems unnecessary, as they mostly do nothing but cry out to their companions in the air and tumultuously applaud their hair-breadth escapes and feats of daring, yet sitting quietly until the setting sun warns them to make ready for the last act—"going to bed."

If we understood crow language perhaps we could now recognize a distinct signal from some grand master of their assembly, summoning all to repose. Be this as it may, a sudden impulse now seizes the throng and the air fairly darkens as successive companies take wing and in silence betake themselves to the roost, flying low as if to avoid observation. Many crows in approaching the places of preliminary gathering necessarily fly over the roost, but not a bird enters it until the general movement begun after sunset. The self-imposed discipline and obedience of such an army puts to shame the strictest military code. Think now of a miserable, weary crow which, having winged his way thither a distance of twenty miles, arrives about sunset at the roost; but, the ingathering not having yet begun, witness how like a true soldier he flaps on to join his more punctual brethren

who have settled half a mile further off to gossip and plume themselves before retiring.

On one occasion I observed large companies arriving in the roost near Merchantville, at a time of full moon, for nearly an hour after sunset. Between the intervals of arrival all would become quiet in their bed-chambers, but, as a more belated company drew near, their cries were responded to by the roosting crows in a different tone. The fliers would hurriedly ejaculate yur, yur, yur, as a Southerner pronounces "here," giving each utterance a rising inflection as if inquiring anxiously of their whereabouts, while those in the roost answered in a falling, drawling tone by slowly repeating their usual "caw" and lengthening it to ca-aw, ca-aw, ca-aw, as if to assure their friends they were resting comfortably. Above all places I ever visited, these roosts afforded the best opportunity for study of bird language, and furnished enough suggestions to threaten mental dyspepsia.

The monosyllabic speech of a crow is by most accounted to be little more than a monoverbic "caw," but let such as thus regard it visit a crow roost and attempt to classify the sounds there produced and, if his ear be well set to music, he'll have a long list.

Among birds so eminently gregarious, language naturally becomes an ever-abiding necessity.

A crow is as great a conversationalist as is the nightingale a great singer; this one, out of the heart's abundance, voices his music from a pure love of harmony; that one, out of the abundance of his wisdom, speaketh; this is the sapphic humming of a tune; the other, a terse, laconic sentence made up of one word, yet calculated by its variety of modulation or of emphasis to convey variety of idea. On every occasion of my visits to those places the strange sounds uttered by those crows already gathered in the dormitory were a continual surprise. Were it possible to reproduce such sounds before a body of ornithologists, nine-tenths of them would have no thought of assigning them to the vocabulary of any North American bird.

Fifteen years' intimate acquaintance with *C. americanus* (prior to visiting a roost) led me to regard him as the most monotonous of linguists, but a more extended experience reveals that he enjoys an after-supper discussion with the family as much as we do. This is also his way of spending the early morning hours before daybreak; and when the air is calm their greetings may

be heard a mile away half an hour before dawn, although they do not begin to disperse till an hour later.

At intervals of half a minute, a certain crow usually relieves the monotony of cawing by making a melodious sound which is inimitable and somewhat resembles the noise made by a porter bottle when skimming swiftly over an expanse of ice.

It has no kinship to cawing, but a semblance to the hollow love-notes of *Scops asio*, shortened into an utterance of two syllables.

I am persuaded that not one of a thousand crows is able or privileged to utter this sound, having often listened in their very midst for an hour without hearing more than three individuals making such. This either implies that one crow differeth from another crow in natural accomplishments, or that there is a recognition of chief speakership among them. Possibly it means both. Another sound is the invariable accompaniment of "going to bed," and judging by its frequence it is not restricted to the few. This, according to a note taken on the spot, is "a strange noise as of a person choking or being strangled to death, or like sound of chicken when caught" and suspended by its neck. This terribly suggestive note is alone sufficient to keep timid and superstitious people away from such haunts.

In early-morning conversations on the roost we can hear the greatest variety of notes. One of the most notable of these resembles laughing in its hilarity of tone, and sounds something like gărrĭck or clă-ă-ă-ă-ărĭck by trilling the a's and r's at a high, feminine pitch of voice. It has kinship to the familiar ejaculation of a strawberry woman in the city street.

Another utterance consists in prolonged clucking as of a hen: clŭŭŭŭŭŭck, or clu-ŭh-ŭh-ŭh-ŭh-ŭh-ck, or, as my field notes have it, "it sounds like a hen trying to gargle." Individual peculiarities of voice arising perhaps from derangement of the vocal organs are often amusing.

I may not soon forget that of a crow in the Merchantville roost which ceased not to cry at intervals of half a minute, "oh wait, oh wait," in a piteous tone, laying peculiar emphasis on "wait," as if upbraiding its companions for leaving it, which they were actually doing at the time.

Whilst lying on the ground observing the actions of this noisy multitude I began "cawing" after the usual fashion of the birds

above me, reproducing, as I thought, their call-note with sufficient exactness. Had I discharged my gun their consternation could not have been greater, for in an instant there was a hush, followed by a sudden uprising of thousands occupying the perches nearest to me, and then for a minute the uproar was tremendous, every tongue seemed upbraiding.

When order was restored I climbed a tree, and on reaching the ordinary roosting level, repeated the experiment. Here I found a man's voice had no terrors, and so long as I "cawed" they took no notice of me.

On comparing the frequency of iteration of the "caw," four times was the rule observed among them when assembled, and exceptions were surprisingly few. When a crow cawed more than four times the caw was shortened to ŏc and hurriedly repeated as often as seven or eight times and was evidently intended to draw particular attention or to express emphatic feelings, either of surprise or joy or alarm.

These observations on the roosting language of crows may receive considerable and interesting addition from a critical study of the bird during the spring and summer seasons, for in the seclusion of the family circle his converse differs widely from that described. By way of conclusion I may further add that the programme of dispersion from the roost in the morning to their feeding grounds is as follows:

After an hour's babel (for such verily is the seeming confusion of tongues) a few crows essay to take leave, but as soon as this folly is observed it literally "brings down the house," and when one imagines the simultaneous shout of twenty acres of crows, one may not wonder that "the house" is fully able to bring down the crows. The "few crows" resume their perches and comparative quiet is restored.

Numerous attempts are thus made with a like result until nearly sunrise, when detachments of 500 to 1000 successively take wing amid the wildest enthusiasm. These circle and wheel about in headlong swoops and elegant curves above the forest, and each having taken his bearings moves off in one of the many lines of flight that eastward, westward, to north and south extend from the common center as the spokes of a wheel.

Ere the sun looks out upon the scene a silence almost oppressive broods over field and woodland, and to one who so recently beheld their departure, a scattered remnant of the mighty host only serves to heighten the feeling of contrasted desolation.

The appended list includes only those roosts in Pennsylvania and New Jersey which have come before the writer's notice, either by actual observation or through the kindness of correspondents. It is given with the hope that its necessary shortcomings may be

speedily supplied by more accurate information and needed corrections.

Burlington island, probably, was never used for roosting purposes by crows, yet I have suggested it as the possible site of "Bristol roost," in order to provoke criticism from some one who knows better.

Locality.	*No. of Roosting Crows.*	*Area of Roosting. Acres.*	*Vegetation Composing Roost.*	*Used or Deserted.*
Beverly, Burlington Co., N. J.....	100,000	20	Chiefly Pines, some Oaks.	Deserted 2 years.
Bridgeborough, Burlington Co., N. J.....	2 or 300,000	?	Young Pines ?	" 5 "
Centertown (Rancocas Forks), Burlington Co., N. J.	" "	15 or 20	Dense Pines.	" 1 "
Florence, Burlington Co., N. J.....	?	?	Young Pines ?	" 45 "
Haines:port, " " "	2 or 300,000	20 or 30	Oak Scrub, some Pines.	In use.
Medford, " " "	Large No.	?	Pines.	?
Tabernacle, " " "	"	?	"	?
Merchantville, Camden Co., N. J.....	150 to 200,000	15 or 20	Oak growth 20 ft. high.	In use.
Newbold's island, Delaware river.....	?	?	Deciduous trees.	Deserted 20 years.
Burlington " " " (?)	"1,000,000"	?	Deciduous trees and reeds	" 50 "
Pea Patch " " "	?	About 30	Reeds of several species.	" 70 "
Reedy " " "	1 or 200,000	" 50	" " "	In use.
Camp Hill, Montgomery Co., Pa.....	200,000	?	Probably Oaks.	Deserted 8 years.
Davis Grove, " " "	"	20	Oak growth 20 ft. high.	In use.

RECENT LITERATURE.

JAPANESE HOMES AND THEIR SURROUNDINGS.[1]—It has long been strenuously maintained by the NATURALIST that human arts can and should be subjected to the same methods as genera and species in natural history. The questions of structure and function, evolution, ontogeny, distribution in time and space, relations as affected by and affecting contiguous phenomena may all be put to the products, appliances and methods of human activity.

Whenever a student of any department of man's works has caught the spirit of this plan of investigation, we have hailed his work as a lasting contribution to the noblest of sciences.

Professor Morse went to Japan as a trained naturalist; his work on the shell-heaps of New England prepared him for his greater work on the shell-heaps of Japan. This accomplished, the most natural sequel was a close study of the modern successors of the primeval race whose sole record remains in their refuse piles. Omitting food, clothing, all other industrial pursuits, the professor gives us in his charming volume an insight into Japanese homes. It were mildly putting the matter to say that the author is in love with his subject, indeed it here and there takes the bit and runs clean away with him. Most people like to read that kind of a work, however, forgiving all eccentricities born of genuine enthusiasm.

If you would study the homes of any people scientifically you must acquaint yourself with their climate, natural materials and progress in other matters; Japan, for instance, has the climate of our Middle States, abounds in bamboo, suffers from earthquakes, is just emerging from barbarism, etc.

A bird's-eye view of a Japanese city reveals a vast sea of roofs—the gray of the shingles and dark slate color of the tiles, with dull reflections from their surfaces, giving a somber effect to the whole. The even expanse is broken here and there by fire-proof buildings ("go-downs") and the temples with great black roofs tower far above the pigmy dwellings. There are no chimneys, no steeples, no sun-obscuring canopy of smoke, but green masses of foliage add life to the gray sea of domiciles.

The Japanese house is unsubstantial in appearance and there is a meagerness of color suggestive of poverty. By contrast also nearly every accessory which we think indispensable to comfort is lacking. In the Japanese house there are two or more sides that have no permanent walls. Within are but few partitions, their place being supplied by sliding screens which run in grooves in the floor and overhead, and may be removed altogether. There are, consequently, no doors or windows. For other reasons, chimneys, attics, cellars, fire-places, furniture, beds, tables, chairs, carpets and mantel-pieces are absent.

[1] *Japanese Homes and their Surroundings.* By EDWARD S. MORSE, director of the Peabody Academy of Science. Boston, Ticknor & Co., 1886, pp. 372, 307 figs.

Walls may be of wood, uncolored or painted black; of plaster, white or slate-colored; or tiled. The roof may be either lightly shingled, heavily tiled or thickly thatched, and has a moderate pitch.

Some houses have verandahs, and all may be entered at several points.

The frame-work of an ordinary Japanese dwelling consists of a number of upright beams which run from a stone base on the ground to the transverse beam and inclines of the roof above. The vertical framing is held together by short strips let into notches in the uprights or by longer strips which pass through mortises in the uprights, and are keyed or pinned into place. A novel feature is the fitting of these uprights upon the rough stone foundation.

It is the roof which gives to Japanese houses that novelty and variety which is so noticeable in different parts of the country. In the shingled roof a slight boarding is first nailed to the rafters. The shingles are very thin and are

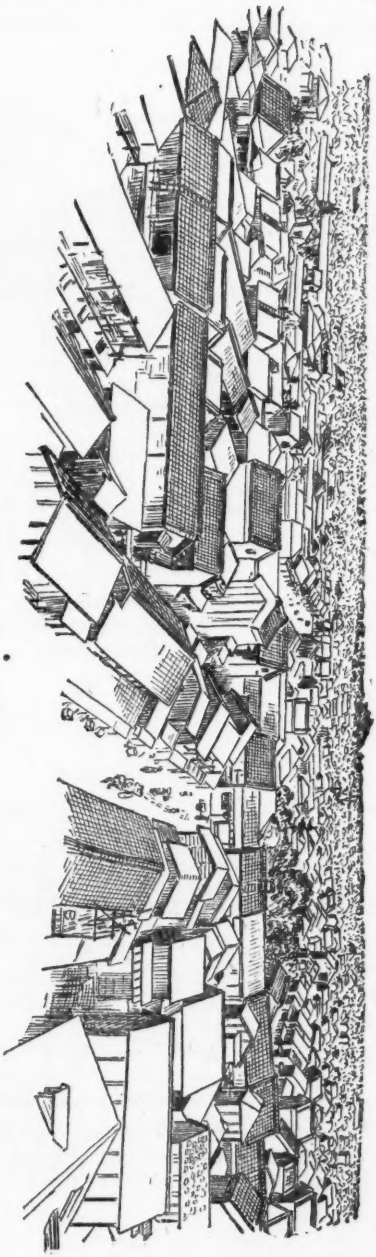


FIG. 1.—A view in Tokio.

fastened down with bamboo pins resembling attenuated shoe-

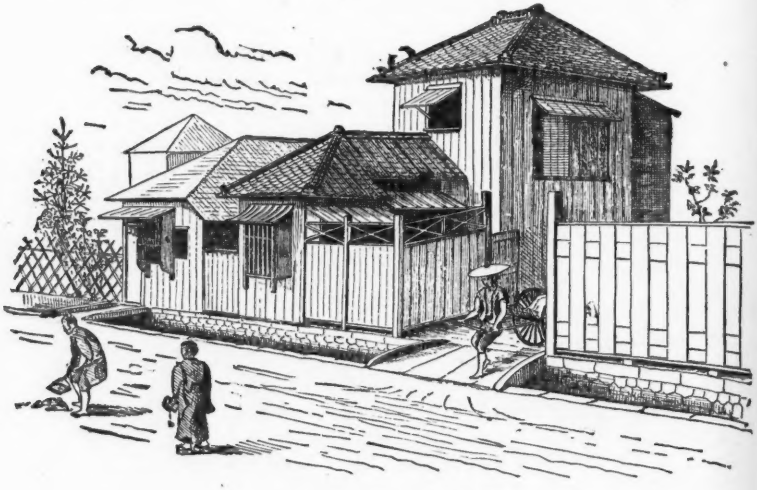


FIG. 2.—Street in Kandu Ku, Tokio.

pegs, and long narrow bamboo strips are often nailed obliquely across the roof from ridge pole to eaves.

In tiling a roof the boarded roof is first roughly and thinly

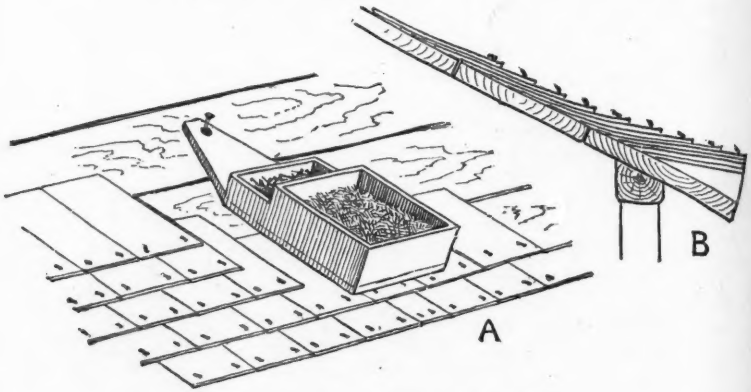


FIG. 3.—Roof with shingles partly laid.

shingled, and upon this surface is spread a thick layer of mud, into which the tiles are firmly imbedded. There seems to be no special adhesion of the tiles to this substratum of mud, and high

gales often cause great havoc. Into the subject of tiles Professor Morse enters most minutely.

The thatched roof is by far the most common form in Japan outside of the cities. The slopes vary but little, but in the design and structure of the ridge the greatest variety of treatment is

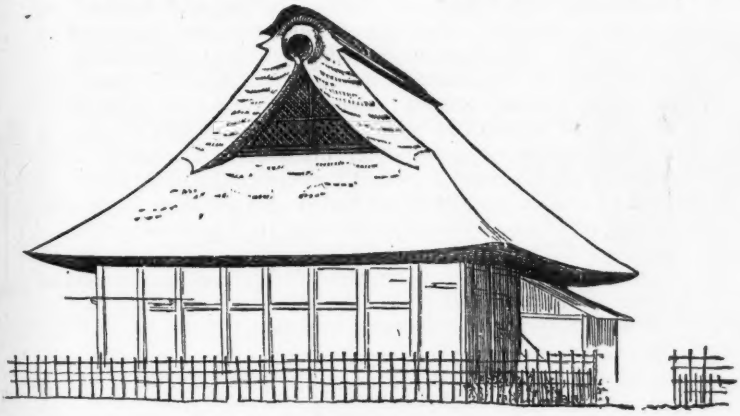


FIG. 4.—Thatched roof near Tokio.

seen. For thatching, straw, grass, reeds and rushes are used, and no special preparation is required to receive the material. Great attention is given to the proper and symmetrical trimming of the thatch at the eaves and at the edges of the gable.

The interior of the house is the work of the cabinet-maker.

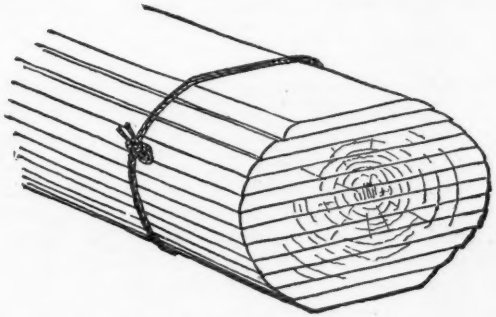


FIG. 5.—Bundle of boards.

Great care is taken to find wood that matches in grain and color, and this can be done only by getting material that has come from the same log. In the lumber yards one notices boards of uniform lengths tied up in bundles in precisely the same position

that the wood occupied in the trunk. As all rooms are made in sizes corresponding to the number of mats they are to contain, the beams, uprights, rafters, floor-boards, ceiling-boards are got out in sizes to fit. From one end of the empire to the other a mat is approximately six feet long and three feet wide.

The ceilings of the Japanese rooms are low, and everywhere appear posts, supports, cross-ties, etc., exposed and decorated in exquisite taste. The most noteworthy feature of the chief apartment is a kind of bay divided into two parts, the *tokonoma* and *chigai-dana*. The bay nearest the verandah is called the *tokonoma*, in which hang one or two pictures, and on its slightly elevated floor stands a vase or some other ornament. The *chigai-dana* has usually a little closet or cupboard closed by sliding screens and one or two shelves above, and also another long shelf near its ceiling, all closed by sliding screens. In the development of these two architectural features Professor Morse dwells at length and with much eloquence upon the advantage of the free-hand architecture of the Japanese over the bilateral symmetry carried to excess in house interiors among us.

The space between the upper end of the screens and the ceiling is the *ramma*, and here Japanese finesse has reveled in panel, diaper, open-bamboo work, porcelain and wood-carving.

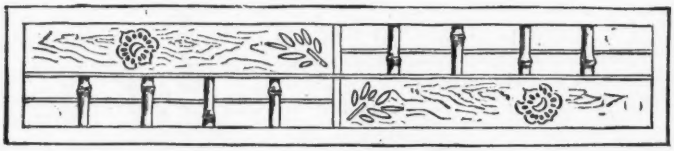


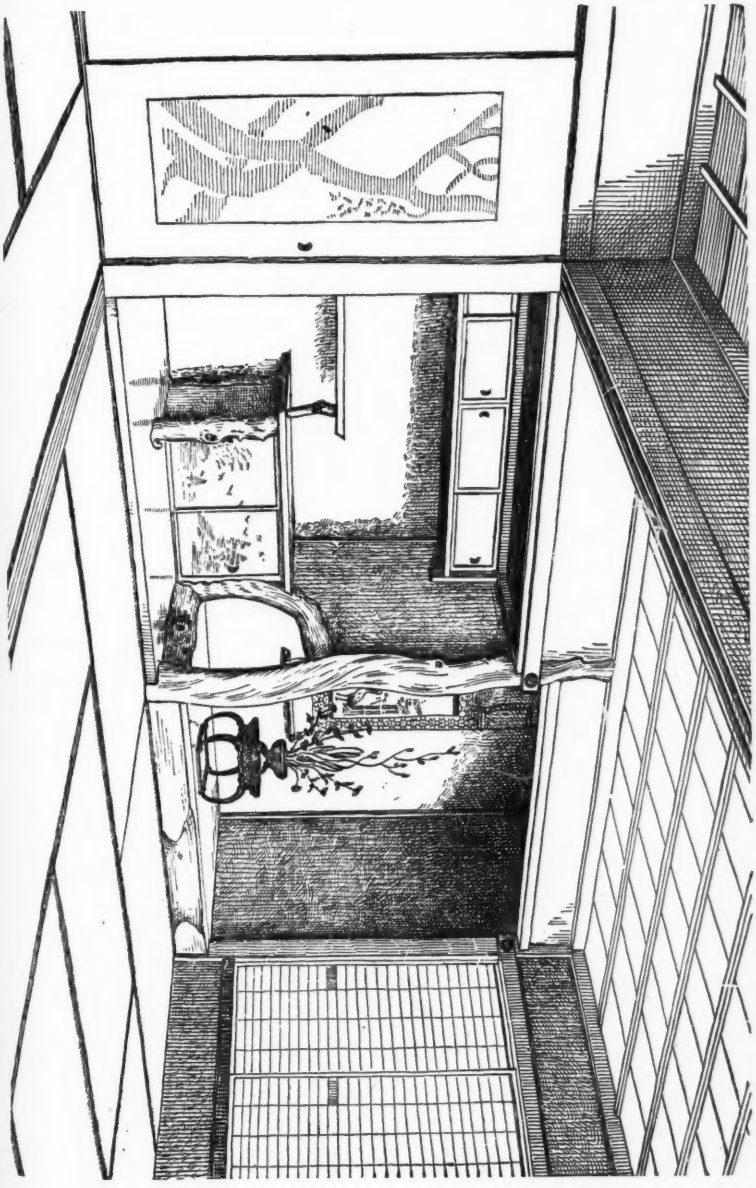
FIG. 6.—Ramma of bamboo and perforated panel.

It would carry us far beyond our allotted space to give a faint conception of the distribution of the interior for the comfort of the family, of the verandahs, bamboo fences, gardens, rooms of convenience and luxury.

Some of the appurtenances are both quaint and primitive. One might see in almost any negro log-cabin devices made of withe and bark to match the accompanying apparatus for holding a pot or basket at different heights. The same thing in metal will be found in almost any Japanese kitchen.

If cleanliness is next to godliness, then verily the Japanese came near to being a godly race. Even the working classes, such as carpenters, masons and others, often bathe two or three times a day. They do not really wash in the baths, but boil or soak in them for awhile, and then upon a platform, with an extra bucket of water and a towel, wash and dry themselves.

PLATE XXVIII.



Guest room in Hachi-ishi.

Every village and town, and nearly every square in the city, possesses public baths where for the price of a cent or two one may find conveniences for a hot bath. Nearly every house among the higher and middle classes possesses the most ample arrangements for hot baths. As a justification of the rather rude bucket, sink and basin outfit for ordinary toilet, Professor Morse adds: "It may seem odd for one to get enthusiastic over so simple an affair as a trough and a few honest contrivances for washing the hands and face; nevertheless such a plain and sensible arrangement is a relief in contrast to certain guest chambers at home, where one finds his movements curtailed to the last degree by a regiment of senseless toilet articles in the shape of attenuated bottles, mugs, soap-dishes with rattling covers, &c., all resting on a slab of white marble."

In a Japanese house the whole floor is a bed, and one can fling himself down on soft mats, in the draught or

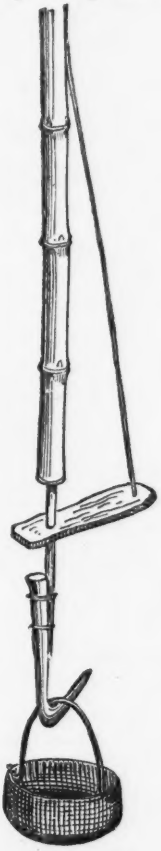


FIG. 7.—Ji-zai.

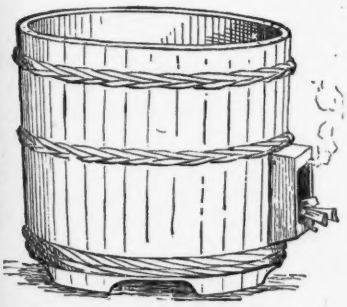


FIG. 8.—Bath-tub with oven.

out of it, up-stairs or down, and find a smooth level surface on which to sleep. The usual form of pillow is a light, closed, wooden box, on the top of which is secured a small cushion stuffed with buckwheat hulls.

The bed-clothes consist of lightly or heavily wadded comforters, which may be made of cheap or costly material, and may be used both as mattress and cover. This form of bed entails much less labor on chambermaids, to say the least.

An inseparable accompaniment of every Japanese home is the

hibachi, or stove. The most usual form consists of a square wooden box lined with copper, between which and the wood is a layer of clay or plaster. More costly forms are made of various materials. This apparatus takes the place of a portable charcoal furnace, and is used both for heating and for keeping warm food about to be served.

FIG. 9.—Head resting on a pillow.

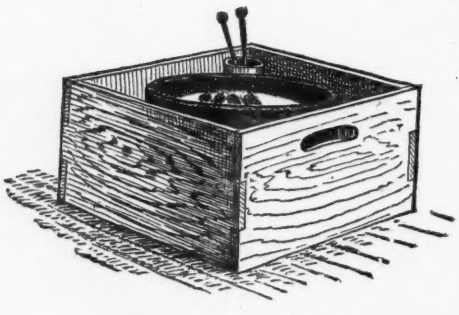


FIG. 10.—Common hibachi.

Professor Morse describes with minutest detail other features of Japanese homes, but we must close.

The Japanese may congratulate themselves that they have found such a Homer to sing their praise. It is to be hoped that Professor Morse will carry out his purpose to supplement the present work with another on Japanese palaces.

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GENERAL NOTES.

GEOGRAPHY AND TRAVELS.[1]

AMERICA.—*American News.*—Col. Fontana, Governor of Chubut (the northern part of Patagonia), has followed the River Chubut to its sources in the Andes, about 42° S. lat., and has thence crossed prairie and forest to the 46th parallel. He found three passes into Chili, laid down accurately the courses of several rivers, found the source of the Senger (an affluent of the Chubut), verified the positions of Lakes Colne and Musters, and determined the positions of the spots at which the Senger and Chico debouch into the lake.——The June issue of the Proceedings of the Royal Geographical Society contains a sketch of the physical geography of Brazil, by James W. Wells, accompanied by a map showing the forest, grass, and arid regions of the country. The account agrees in the main with that given by Mr. Orville Derby, in the AMERICAN NATURALIST, not long ago, but contains many interesting details about the present state of the population, the railways which, diverging from Sao Paulo, Rio de Janeiro, Bahia and Pernambuco, are linking the interior to the coast, and other matters.——A tolerably full account of the superficies, soil, climate, people, commerce and industries of Venezuela, by M. P. Druyckler, may be found in the Bulletin of the Antwerp Royal Geographical Society, 1886, 5th fascicule.——Guatemala had, on January 1st, 1886, a population of 1,322,544, showing an increase of 37,940 over that of the first day of 1885, or nearly three per cent per annum. The births in 1885 were 63,687, the deaths 25,747.

ASIA.—*Persia.*—Mr. J. A. Rees describes, in notes published last year at Madras, a journey from Kasvin to Hamadan, west of Teheran. The country between these points is much more fertile and thickly populated than has been generally supposed. Away up to the Elburz range extend fertile and well-watered plains, covered with corn (grain), vineyards and orchards, while the hills give a fair return of wheat without irrigation. Mr. Rees believes that the population of Persia is much under-estimated. Persian notions about Francistan and Inglestan, the division of Farangistan, and of the country of the "Ooroos" (Russia) are rather amusing.

Exploration on the Lena.—Dr. Bunge and Baron von Toll, who are charged by the Russian Geographical Society with the exploration of the New Siberian islands, explored last year the whole region of the Yana with its mountains, obtaining rich palæontological collections, four hundred kinds of plants, and a large number of insects, mollusks, etc. Six examples of *Ovis borealis* were taken on the mountains on the right bank of the Lena. According to information received September 5, 1885,

[1] This department is edited by W. N. LOCKINGTON, Philadelphia.

Dr. Bunge was preparing to visit the New Siberian Island of Koteling this spring.

The Turki Tongues.—Mr. Morison, of Tiflis, has contributed to the Journal of the Royal Asiatic Society a summary of the distribution of the Turki languages. Turki proper is spoken by the Turks of the Ottoman empire, in the Russian governments of Nijni Novgorod, Kasan, Simbirsk, Viatka and Orenburg; in Trans-Caucasia and in N. W. Persia. The Nogai branch is used in Bessarabia, the Crimea, Cis-Caucasia, the Volga delta, Northeast Daghestan, the Terek valley, the N. W. shore of the Caspian, Kasan, Simbirsk, Orenburg and Ufa; the Uigar branch in Yarkhand and Chinese Tartary, the Tekke country, the Zarafshan valley, Khiva and Kuldja; the Kirghiz from the Volga to the confines of Manchuria, especially in S. W. Siberia; and the Yakut in N. E. Siberia and the northern slopes of Mount Sayan. Thus the Ugro-Altaic tongues extend over 100° of longitude and 35° of latitude, and Turki alone is the language of twenty millions of people.

Asiatic News.—Baron Miklukho Maclay has returned to Odessa from a two years' stay in New Guinea. He has a large collection. ——A mission, armed with letters granted from Pekin, is probably now on its way from Darjceling to Lhassa. It is under the charge of Mr. C. Macaulay, with Dr. Oldham for geologist, and Dr. Cunningham for naturalist. The only Englishman who has hitherto visited Lhassa is Thomas Manning, and much may be expected from an expedition along so unknown a route.——Mr. A. Hosie (Proc. Roy. Geog. Soc.) gives an account of a journey in Southwestern China, from Ssŭ-ch'uan to Western Yunnan. Ssŭ-ch'uan is the most important of the western provinces of China, contains thirty millions of inhabitants, and is a manufacturing province, exporting largely to its neighbors.——Mr. G. Taylor continues in the *China Review* his remarks upon the Formosa natives. Dealing only with a small section of the south, he has yet described six or seven tribes widely differing from each other. Some of these look down upon others as strangers and new-comers, though the Chinese have supposed all to be aborigines. The Amias, who are said to have been brought by shipwreck, worship one Supreme Being, and believe in a future state dependent on conduct in this life. Among the Tipuns, when a man marries, he enters his wife's family, while among the Paiwans the reverse is the case. The Tipuns have a tradition that they came from some other country.

AFRICA.—*The Congo.*—The point at which the French possessions and the Congo Free State meet upon the Congo has been fixed at the intersection of the river with the parallel of 6° 20′ S. lat., 400 meters from the village of Pombo, and on the right bank of the Ubangi. The line from thence to the coast has not been

explored. The four commissioners ascended the Ubangi, which seemed to start in the right direction, but found that it turned northward. The Ubangi and Licona-Nbunga are two perfectly distinct streams, instead of forming a common delta, as has been before stated.

The Island of Diego Garciâ.—Gilbert C. Bourne describes in the June issue of the Proc. Royal Geographical Society the coral atoll of Diego Garciâ, belonging to the Chagos group. There are four openings into the lagoon, one of which affords a passage six to eight fathoms deep. The lagoon has an average depth of eleven fathoms, and forms a good harbor. The strip of land varies from about twenty yards to a mile in width, and is densely covered with cocoanut palms, *Scævola kœnigii* and *Tournefortia argentea*. The interior parts of the main island have a black peaty mould, formed by the decayed leaves of the cocoa-palms. Here grow *Guetturda speciosa*, or "bois de feu;" and *Cordia subcordata*, or "bois malgache." A Casuarina grows on the east side of the island, and *Hernandia peltata* and *H. ovigera* (bois blanc), as well as *Pisonia inermis*, also occur. The gaiac (*Afzelia bijuga*) forms a single group in the northeast. The staple produce is cocoanut oil, and the island is in the hands of a company at Mauritius. The only wild animals are introduced rats; fifteen species of birds occur, only one a land bird; the Mauritian gecko (*Platydactylus mauritanicus*) is common, and there is a mud tortoise in some of the marshy pools. The insect fauna is poor in species, but rich in individuals, and includes flies, mosquitoes, cockroaches and ants. Coleoptera are scarce. Three species of Gecarcinus are common, and effectually put a stop to all efforts to grow garden vegetables. Mr. Bourne settles the controversy concerning the tree-climbing habits of *Birgus latro* by declaring that he has seen it do so. It eats the nuts that are on the ground, but ascends the palms for shade and protection.

African News.—Dr. Fischer has just recovered from fever contracted at Kagehi, on the southern shore of Lake Victoria, Nyanza. He was not able to reach Unyoro through Uganda on account of the threatening attitude of the Kabakas, the murderers of Bishop Harrington. He will attempt to reach Unyoro by making a detour of Uganda, but is not sanguine.——The engineer of the Suez canal has informed Gen. J. T. Walker that (1) the annual mean level of the Mediterranean at Port Said is the same as that of the Red sea at Suez, and (2) according to the observations of the Panama Canal Company there is no difference of moment between the levels of the Atlantic at Colon and of the Pacific at Panama.——The trunk left at Brussels by Maurizio Buonfanti, who claimed to have made a journey across Africa, from the Mediterranean to the Niger and Gulf of Guinea, has been examined. The trunk contained letters, romances, come-

dies, cuttings from newspapers, but nothing about the journey. ——King Menelik of Shoa has, through the influence of Count Antonelli, prohibited traffic in slaves, and in consequence of this ill-feeling has arisen between him and the neighboring Sultan Anfari, of Haussa.——A tribe of Danakils recently fell upon and killed two Frenchmen and their Abyssinian escort, also the brother of the sultan of the region.——Herr B. Schwartz has succeeded in penetrating the region behind the Cameroon mountains, which Rogorinski was prevented from reaching by the jealousy of a native tribe. The River Kumba, an affluent of the Mango, was crossed, the territory of Bafu, a great slave mart and the home of the Ba-Farani, was reached, and the upper course of the Calabar almost gained after passing the popular cities of Kumba and Kimendi, when an attack by five hundred armed Ba Farani slaves compelled the traveler to retreat.——Full particulars of the massacre of the Italian expedition under Count Porro are contained in a recent number of the Bolletino della Societá Geographica de Italia. It appears that the Emir of Harrar has suddenly been fired with fanaticism, which prompts him to expel all Christian traders. On April 25 he attacked the British post of Gialdessa, took captive the Arab and Somali garrison and the escort of the Italians, and killed all the Italians of the expedition.

GEOLOGY AND PALÆONTOLOGY.

WALCOTT ON THE CAMBRIAN OF NORTH AMERICA.—Mr. Walcott has contributed to the August issue of the *American Journal of Science* an able essay upon the Cambrian system. He regards the Potsdam of New York and the Mississippi valley, with Dicellocephalus, as Upper Cambrian; while the Cambrian of Newfoundland and Braintree, Mass., with Paradoxides, he places in the Lower Cambrian. This conclusion is reached by a study of the exposures of Cambrian strata in the Colorado and Wasatch regions. The entire Upper Cambrian is absent from the Wasatch mountains, the Silurian resting unconformably on strata of Middle Cambrian age. Between the Silurian and the granite below lie 12,000 feet of siliceous shales, quartzites and sandstones. The upper 250 feet of silico-argillaceous shales contain Cruziana? *Lingulella ella*, *Kutorgina pannula*, *Hyolithes billingsi*, *Leperditia argenta*, *Olenellus gilberti*, *Ptychoparia quadrans* and *Bathyuriscus producta*, all of which occur at the same horizon in several localities in Nevada. The Lower beds contain no fossils. In the Eureka district (Nev.), the lower 1500 feet of quartzites corresponds to the upper half of the 3000 feet of quartzite in the Wasatch, and the Olenellus shales occur at the summit of the quartzite. But between these shales and the Silurian lie over 6000 feet of limestone with a fauna uniting the Middle Cambrian with the

Upper Cambrian, or Potsdam, the characteristic forms of which occur 4500 feet above the Olenellus horizon.

On the Grand cañon of the Colorado the Tonto beds (1000 feet) carry a fauna akin to that of the Upper Cambrian of Nevada, Texas and the Upper Mississippi valley. Beneath the Tonto lies the Grand Cañon series, which Mr. Walcott classes, together with the Keweenaw of Wisconsin and the Llano of Texas, as pre-Cambrian.

The Eureka and Highland Range sections in Nevada and the Georgia section in Vermont prove the stratigraphic position of the Middle Cambrian. In Nevada the Middle Cambrian fauna is from 2000 to 4000 feet below the Potsdam, and only three species pass up into it. In the Georgia (Vt.) section one species seems to pass up into the Potsdam. Not a single one of the Lower Cambrian species passes up into the Middle Cambrian. Mr. Walcott explains the absence of Lower Cambrian fossils in the Western Lower Cambrian strata, and the peculiar distribution of the Lower Cambrian in the East, by the supposition that in the Lower Cambrian age a barrier existed which prevented the extension westward of the Lower Cambrian fauna.

According to Mr. Walcott 92 genera and 393 species are now known from the American Cambrian. He gives the following résumé:

	Genera.	*Species.*
Upper Cambrian	52	213
Middle "	43	107
Lower "	32	76
	127	396
Reappearances	35	3
Total fauna	92	393

	Genera.	*Species.*
Algæ	3	9
Spongiæ	6	13
Hydrozoa	4	5
Crinoidea	1	3
Annelida	2	5
Brachiopoda	15	67
Lamellibranchiata	1	1
Gastropoda	14	29
Pteropoda	5	20
Crustacea	10	15
Pœcilopoda	31	226
	92	393

Fourteen genera are common to the Lower and Middle Cambrian; fifteen to the Middle and Upper; eleven to all three divisions, while twelve occur in both Lower and Upper Cambrian. Seventeen genera of the Upper Cambrian, viz., Lingula, Orthis, Leptæna, Triplesia, Bellerophon, Euomphalus, Holopea, Maclu-

rea, Metoptoma, Ophileta, Pleurotomaria, Hyolithes, Serpulites, Amphion, Bathyurus and Ogygia, are better represented in the Middle Cambrian. Discina, Pleurotomaria, Amphion, Bathyurus and Ogygia are doubtfully referred to the Cambrian. Several other genera pass up into the base of the Lower Silurian.

GEOLOGICAL NEWS.—*General.*—M. Jelsky (Bull. d. l. Soc. Geol. de France. 1885, 581,) brings forward concerning the origin of earthquakes and the lifting of mountain chains a theory to some extent new. Postulating a liquid interior and the constant sinking of the heaviest portions of the crust, which he believes to be the ocean bottoms, he shows that the sinking cannot be perfectly uniform, since a solid always bears much compression before it yields, and asserts that the sudden sinking must produce a plutonic wave on the surface of the liquid interior. Under the continents cavities probably exist, caused by the lifting of the crust by former plutonic waves which, when they sank, left a space beneath the crust their movement had raised. When an earthquake is produced by sinking of the sea-bottom, it may (1) spread itself over a vast area if it is propagated to a broad sub-continental cavity; or (2) it may produce a volcanic eruption; or (3) it may lift a portion of the neighboring continent. The presence of volcanoes is thus attributed to the pressure of the plutonic wave, and this explains the frequency of volcanoes in non-continental regions, or near the sea-margins, where there is no extensive cavity below. The perpetual waste to which a continent is subjected must finally cause its ruin; the vault becoming so thin that it breaks at the shock of a great plutonic wave. The recoil of the wave, aided by the weight of the broken vault, will cause the elevation of a portion of the sea-bottom and the formation of a new mountain chain, while the sea, rolling toward the sinking part, aids the change by the transference of its weight.——Professors Romanovsky and Moushketoff have issued the first of three volumes upon the geology of Turkestan. From this it appears that nearly the whole of the Aral basin, including the wide tracts east and south-east of the lake, is covered with chalk; the remaining twentieth being occupied by crystalline unstratified rocks, metamorphic slates, and Palæozoic deposits, all the hills rising above the steppes being Archæan or Palæozoic. Jurassic deposits appear on the Baidam and Saram rivers, on the borders of the East Aral basin, and in Ferganah; they contain valuable deposits of coal. Chalk and Tertiary deposits are so closely connected that it is difficult to separate them. The chalk has few species of fossils, though they occur in immense masses, and the Tertiary is still poorer in life-remains. The Eocene deposits consist for the most part of deep-sea Nummulitic sandstones, and are covered by Oligocene and Miocene, showing by their fossils a gradual shallowing of the sea. The Post-pliocene deposits, which extend from the

Volga to the foot of the Tian-Shan, do not exceed one hundred feet in thickness, and can hardly be delimitated more the Tertiary; the fossils they contain all belong to species now living in the Caspian and Aral. The limits of the Aral-Caspian Post-pliocene sea are discussed.

Silurian.—J. H. Panton has noted the occurrence of upwards of fifty species of corals, brachiopods, and cephalopods, with Receptaculites, Beatricia and Stromatopora, in a rock of Silurian age largely used in Winnipeg as a building stone. The seven exposures are described, most of them upon the level, but some elevated slightly above the prairie, though all were more or less covered with drift before quarrying was commenced.——*The American Journal of Science* (April, 1886) contains another contribution to the literature of the Taconic rocks in the shape of descriptions of Lower Silurian fossils from a limestone of the original Taconic of Emmons. The report upon the fossils is by S. W. Ford and W. B. Dwight, and Professor J. D. Dana concludes from the results that these limestones of Canaan, N. Y., are of Trenton age.

Carboniferous and Permian.—According to the researches of M. B. Renault, the genus Bornia must be ranged with Calamodendron and Arthropitus. From these genera it differs in the want of sterile verticils; all the bracts are fertile, and bear four sacs radially arranged under their peltoid extremity. The secondary wood is not divided into distinct bundles by cellular or fibrous bands, and the primary wood is not rooted (*enclavé*) in the secondary wood as in the other two genera. *Bornia transitionis* occurs in a silicified bed of the age of the culm, northwest of the coal measures of Autun, France.——Permian beds form a large part of the secondary chains of the Vosges, and the strata consist of a series of red sandstones capped with andesitic melaphyres and tufa (Middle Permian); and of argilolites-argillaceous tufa with more or less of porphyry (Lower Permian). The argilolites yield numerous silicified trunks, and are the only fossiliferous beds of this age on the Vosges. The Permian red sandstone of the Vosges differs from that of Triassic age, not only by its argillaceous nature, and the fragmentary character of its elements, but by its relief. The hills formed by it, instead of the square flattened form of Triassic hills, are pitons or irregular domes. Vegetation is sparse.

Triassic.—Professor J. W. Judd (Proc. Royal Society, 1885) comes to the conclusion that, spite of stratigraphical evidence, the yellow sandstones north of Elgin, Scotland, are of Triassic instead of Devonian age. The beds have yielded remains of Lacertilia (Telerpeton, Hyperodapedon), Crocodilia (Stagonolepis), Dinosauria and Dicynodontia (Dicynodon), orders which have never been found in Palæozoic rocks. Though the difference in mineral characters between these beds and those of the upper Old Red

sandstone is not very great, the stone can be distinguished by a good observer; and the question seemed to be finally set at rest by the discovery, in the same quarry, of Devonian rocks with Holoptychius, overlaid by a bed of conglomerate which graduates upward into the reptiliferous sandstone.

Jurassic.—The Bulletin of the French Geological Society (April, 1885) contains a note upon the zones of the inferior oolite of the southern border of the Paris basin. The zones are, M. de Grossouvre maintains, best characterized by various species of ammonites; lamellibranchs and gastropods having in that region too great a vertical range.

Cretaceous.—M. Dollo has a note upon a tooth of *Craspedodon lonzeensis*, an ornithopod dinosaurian from the Middle Senonian of Lonzée. The tooth is furnished with large ridges on the sides and is minutely crenellated on the front upper edge of the crown. Three teeth are all that has yet been found of the genus, which raises the number of ornithopodous genera to twelve.——M. Dollo (Ann. de la Soc. Scient. de Bruxelles) has a note upon the presence of a median basioccipital canal and two hypobasilar canals in *Plioplatecarpus marshi*, a mosasaurid. These canals are by their discoverer believed to have served for the passage of the occipital sinus and infrajugular veins. In a skeleton of the same species M. Dollo has also discovered an interclavicle, a bone not before known to exist in the Mosasauria. On the strength of this peculiarity M. Dollo divides the Mosasaurians into Plioplatecarpidæ and Mosasauridæ.

Tertiary.—M. Depenet and Rerolle conclude an examination of the Miocene of the Cerdagne basin (France) by referring it to the base of the Upper Miocene, to the horizon of Eppelsheim, slightly below the faunæ of Pikermi and Luberon.——M. Chelot (Bull. de la. Soc. Geol. de France, 1885, pp. 191–202) gives a review and rectification of the synonymy of a large number of the species of the Eocene basin of Paris.——The discovery of a skeleton of Halitherium at Darmstadt, and of the left half of a pelvis at the base of the Fontainbleau sands at Montmorency, have proved that this genus, though classed with the Sirenia, possessed not only a complete pelvis, but rudimentary femurs. M. Flot points out that this establishes the transition between the Sirenia (which he classes with the Cetacea) and other mammals.

BOTANY.[1]

THE PHALLOIDEÆ OR STINK-HORN FUNGI.—A recent paper[2] by Dr. Fischer, of the University of Berne, brings together the literature of this interesting group of fungi. Seventy-three species are recognized, and these are distributed into eleven genera.

[1] Edited by Professor CHARLES E. BESSEY, Lincoln, Nebraska.

[2] Versuch einer systematischen Uebersicht über die bisher bekannten Phalloideen. Von Dr. Ed. Fischer, Berlin, 1886.

Their geographical distribution is mainly tropical and sub-tropical, the Southern hemisphere having many more representatives than the Northern. They are summed up as follows, viz:

Europe	4	Polynesia and New Zealand	4
Asia	7	North Africa	6
East Indian Archipelago and Ceylon	14 or 15	South Africa	6 or 7
Australia	18 or 20	North America	12 or 15
		South America and West Indies	15 or 16

Their systematic arrangement may be understood from the following catalogue:

Genus I. DICTYOPHORA.

1. *D. campanulata* Nees, *Java*. 2. *D. brasiliensis* Schl., *Brazil*. 3. *D. phalloidea* Desv., (*Phallus indusiatus* Vent.), *Dutch Guiana*, and doubtfully from *North America*. 4. *D. speciosa* Meyen, *Phillipine Islands* and *Southern Asia*. 5. *D. rosea* Ed. Fischer, *Borneo*. 6. *D. radicata* Mont., *Cayenne*. 7. *D. dæmonum* Ed. Fischer (*Phallus dæmonum* Rumple), *East Indies* and doubtfully from *North America*. 8. *D. tahitensis*, Ed. Fischer, *Tahiti* and *Australia*. 9. *D. multicolor* Berk & Br., *Australia*. 10. *D. duplicata* Ed. Fischer, (*Phallus duplicatus* Bosc.), *North America*. 11. *D. merulina* Berk., *Java* and *Australia*. 12. *D. subiculata* Mont., *Northern Africa*. 13. *D.* ———— This undescribed species and the preceding (No. 12) are noted as "doubtful species."

Genus II. ITHYPHALLUS.

1. *I. impudicus* Ed. Fischer (*Phallus impudicus* L.). This commonest of the stink-horns occurs throughout *Europe*, in *North Africa*, *North America*, *Japan*. 2. *I. tenuis* Ed. Fischer, *Java*. 3. *I. quadricolor* Ed. Fischer, *Australia*. 4. *I. calyptratus* Ed. Fischer, *Australia*. 5. *I.* (?) *Novæ-hollandiæ* Ed. Fischer, *Australia*. 6. *I. roseus* Ed. Fischer, *Northern Africa*. 7. *I.* (?) *canariensis* Ed. Fischer, *Canary Islands*. 8. *I. rugulosus* Ed. Fischer, *Japan*. 9. *I. ravenelii* Ed. Fischer (*Phallus ravenelii* B. & C.), *North America*. 10. *I. retusus* Ed. Fischer, *Australia*. 11. *I. campanulatus* Ed. Fischer, *South America*. 12. *I. rubicundus* Ed. Fischer (*Phallus rubicundus* Fries), *North America*. 13. *I. aurantiacus* Ed. Fischer, *East Indies*.

Genus III. MUTINUS.

1. *M. caninus* Ed. Fischer (*Phallus caninus* Huds.), *Europe* and *North America*. 2. *M. bambusinus* Ed. Fischer, *Java*. 3. *M. ravenelii* Ed. Fischer, (*Corynites ravenelii* B. & C.), *North America*. 4. *M. curtisii* Ed. Fischer, *North America*. 5. *M. borneensis* Cesati, *Borneo*. 6. *M.* (?) *Watsoni* Ed. Fischer, *Australia*. 7. *M.* (?) *curtus* Ed. Eischer, *Australia*. 8. *M.* (?) *papuasius* Kalch, *Australia*. 9. *M. discolor* Ed. Fischer, *Australia*.

Genus IV. KALCHBRENNERA.

1. *K. tuckii* Berk, *South Africa*. 2. *K. corallocephala* Kalch, *South Africa*.

Genus V. SIMBLUM.

1. *S. rubescens* Gerard, *North America*. 2. *S. sphærocephalum* Schlecht, *South America*. 3. *S. lorentzii* Spegaz, *South America*. 4. *S. periphragmoides* Klotzsch, *Mauritius*. 5. *S. pilidiatum* Ernst, *South America*. 6. *S. gracile* Berk, *Ceylon*. 7. *S. australe* Spegaz, *South America*. 8. *S. flavescens* Kurtz, *Java*.

Genus VI. CLATHRUS.

1. *C. triscapus* Ed. Fischer, *West Indies*, and doubtfully from *North America*. 2. *C. braziliensis* Ed. Fischer, *South America*. 3. *C. columnatus* Bosc., *North America*. 4. *C. angolensis* Ed. Fischer, *South Africa*. 5. *C. pusillus* Berk, *Australia*. 6. *C. cancellatus* Touru, *Europe*, *North Africa*, *North America*, *East Indies*, *New Zealand*. 7. *C. delicatus* Berk & Br., *Ceylon*. 8. *C. gracilis* Ed. Fischer, *Australia*. 9. *C. cibarius* Ed. Fischer, *New Zealand*. 10. *C. crispus* Turpin, *South America*, and possibly from *Mexico* and the *West Indies*. 11. *C. albidus* L. Becker, *Australia*.

Genus VII. COLUS.

1. *C. hirudinosus* Car & Séch., *Europe* and *North Africa*. 2. *C. gardneri* Ed. Fischer, *Ceylon*.

Genus VIII LYSURUS.

1. *L. mokusin* Fries, *China*. 2. *L. claraianus* Müll. Arg., *South America*. 3. *L. texensis* Ellis, *North America*.

Genus IX. ANTHURUS.

1. *A. Woodii* MacOwen, *South Africa*. 2. *A. mullerianus* Kalch, *Australia*. 3. *A.* (?) *cruciatus* Lep. & Mont., *South America*. 4. *A.* (?) *archeri* Ed. Fischer, *Tasmania*.

Genus X. CALATHISCUS.

1. *C. sepia* Mont., *East Indies*. 2. *C. puiggarii* Spegaz, *South America*.

Genus XI. ASEROE.

1. *A. junghuhnii* Schlecht, *Java*. 2. *A. zeylanica* Berk, *Ceylon*. 3. *A. rubra* La Billard, *Australia* and *Tasmania*. 4. *A. viridis* Berk & Hook fil, *New Zealand*. 5. *A. lysuroides* Ed. Fischer, *Australia*.

THE RUST OF THE ASH TREE.—Last year the writer called attention to the great abundance of rust (*Æcidium fraxini* Schw.) on the leaves, petioles, fruits and twigs of the green ash (*Fraxinus viridis*). This was remarkable in the city of Lincoln, so much so as to attract the attention of even the unscientific eye. This year it was expected that the parasite would be much more abundant, but to the astonishment of all, very little appeared. It often required a good deal of searching to find specimens for class illustration. Dr. Halsted, of Ames, Iowa, reports an exactly similar condition of things in his flora, the abundance of the last year's crop of rust being followed this year by a great dearth.

What can be the explanation of this? Why should the trees be so free this year, when such myriads of spores were produced last year?—*Charles E. Bessey.*

TWIGS KILLED BY TELEPHONE WIRES.—I made an observation last summer that may be of interest to NATURALIST readers. The telephone wire from Lunenburg to Fitchburg runs for a portion of the way through thick woods, and is hung for the most part on the trees. It crosses the road frequently to find the best trees for support. When driving along the road in midsummer, the course of the wire could be plainly traced some distance ahead by the dead twigs and branches on the trees. As the branches bore the dead foliage it was evident that they had died since the spring. Some of them were an inch in diameter at the point nearest the wire, and extended four or five feet beyond it; others were mere twigs. I searched for evidence of branches killed in previous years, but found none. As a rule the dead branches were not touched by the wire, nor did the wire touch any part of the tree, the distance to the branches being mostly a full foot or more. Not all the branches near which the wire passed were killed, but enough to enable one to trace its course

for fifty rods ahead. In many cases a branch was killed, while another on the same tree, still nearer to the wire, was alive.

I noted the following kinds of trees as the ones principally affected, viz: White pine, white oak, red oak, white maple, rock maple, white birch and poplar. At one point the wire passed through several apple trees, but I could see no traces of dead leaves there.—*F. E. L. Beal, Fitchburg, Mass.*

An Instance of Individual Variation.—Some three or four years ago I noticed in the Naturalist the variation of the hickory trees in this vicinity as to the times of ripening their leaves. The facts then set forth were simply that upon some trees the leaves were ripe and withered into ashen-gray, while upon others they remained green until killed by the hard frosts of middle or late autumn. Others ripened all along between these extremes.

This spring I noticed the same differences in the times of putting forth their leaves. Upon some trees the leaves were fully one-third grown, while upon others, not more than a yard distant, the buds were still dormant. It was very curious to notice the changes from day to day, when

> "Young leaflets deepened into greenness,
> And spread to the coming heat."

Scarcely any two of the trees along my road of a mile and a half into town seemed to be putting forth their leaves exactly alike. Each differed from its near neighbors in some slight degree. Modern science teaches us that it is from such minute variations that the present diversity in nature has been evolved. —*Charles Aldrich, Webster City, Iowa.*

Botanical News.—Important articles in recent journals are as follows, viz: *Gardeners' Chronicle:* A new mold on potatoes (*Phycomyces splendens*), with figures; *Abies pinsapo*, with figures of twig and male flowers; Self-fertilization of *Epidendrum variegatum;* Disease of larch and pine seedlings, with figures. *Journal of Botany:* New and noteworthy fungi; Notes on British Rubi. *Grevillea:* Præcursores ad Monographia Polypororum. *Botanische Zeitung:* Ueber einige Sclerotinien und Sclerotienkrankheiten (De Bary). *Flora:* Die Stellung der Honigbehälter und der Befruchtungswerkzeuge in den Blumen (Jordan). *Torrey Bulletin:* Check-list of marine algæ; New grasses (Vasey); A new moss from Oregon (Müller). *American Monthly Microscopical Journal:* Key to the Desmidieæ; Provisional key to the classification of algæ of fresh water. *The Michigan Horticulturist:* Botany at the Michigan Agricultural College. *Proc. Davenport Academy of Sciences*: Harfordia, a new genus of Eriogoneæ from Lower California (Parry).——In a late bulletin of the Agricultural College of Michigan, Professor Beal publishes an interesting series of replies to questions about grasses.——We note

with pleasure the Seed Catalogue, issued by Damman & Co., of San Giovanni a Teduccio (near Naples), Italy. Botanic gardens can secure many desirable plants from this catalogue.——The first number of Cooke's British Desmids has just come to hand. It resembles in text and plates the well-known "British Fresh-water Algæ," by the same author. It is to be completed in about ten parts, including all told about eighty plates, and will cost about twelve or thirteen dollars.

ENTOMOLOGY.

A NEW ARRANGEMENT OF THE ORDERS OF INSECTS.—In preparing for the press our larger "Zoölogy," also in our "First Lesson in Zoölogy," which has just appeared from the press, we have admitted sixteen instead of eight orders of insects heretofore recognized by us. Below is given a very brief synopsis, prepared for popular use, of this class of insects. The Pseudoneuroptera as the result of farther examination and reflection, are dismembered into the Platyptera (which was characterized in the Third Report U. S. Entomological Commission), the Odonata and the Plectoptera. The latter name is proposed for the May-flies or Ephemeridæ, which we are disposed, with Brauer, to regard as a distinct order, and for which no suitable ordinal name has been hitherto proposed. The same is the case with the Mecaptera, a name proposed for the Panorpidæ, referred, we think, with justice, by Brauer, to a distinct order. Our reasons for this change in classification we hope to present on a future occasion.

ORDERS OF INSECTS.

1. Wingless, often with a spring..... *Thysanura:* Spring-tails, etc.
2. Fore wings minute, elytra-like..... *Dermaptera:* Earwig.
3. Wings net-veined; fore wings narrow; hind wings folded..... *Orthoptera:* Locusts, Grasshoppers.
4. Four net-veined wings; mouth-parts adapted for biting..... *Platyptera:* White Ants, Bird-lice.
5. Wings, net-veined, equal..... *Odonata:* Dragon-flies.
6. Wings net-veined, unequal..... *Plectoptera:* May flies.
7. Mouth beak-like, but with palpi..... *Thysanoptera:* Thrips.
8. Mouth-parts forming a beak for sucking; no palpi..... *Hemiptera:* Bugs.
9. Wings net-veined; metamorphosis complete. *Neuroptera:* Lace-winged Fly, etc.
10. Wings long and narrow..... *Mecaptera:* Panorpa.
11. Wings not net-veined..... *Trichoptera:* Caddis-fly.
12. Fore wings sheathing the hinder ones..... *Coleoptera:* Beetles.
13. Wingless, parasitic..... *Siphonaptera:* Flea.
14. One pair of wings..... *Diptera:* Flies.
15. Four wings and body scaled..... *Lepidoptera:* Butterflies.
16. Four clear wings; hinder pair small; a tongue. *Hymenoptera:* Bees, Wasps, etc.

—*A. S. Packard.*

LUMINOUS ORGANS OF MEXICAN CUCUYO.—Carl Heinemann, of Vera Cruz, publishes in *Archiv f. Mikr. Anat.*, XXVI, 296 (June, 1886), extended observations on several species of the Cucuyo (Pyrophorus). Each beetle has three lamps, a pair of smaller

dorsal lamps on the prothorax near its margin, and a large ventral lamp on its abdomen. The organs are developments of the hypodermis, are largest in the male, and the abdominal one is so thin and transparent that we can see the ventral nerve-cord through it. Branches of the trachea end in the luminous cells; they are bordered by such cells, but no end-cell on the trachea could be made out. Internal to the luminous layer is a non-luminous layer, formed by tracheal branches and irregular cell-masses, specially rich in urates. Though the light is usually nocturnal, yet if the animal is disturbed by day it will shine less brilliantly. Even a sleeping cucuyo will show in a dark chamber a mild light from the dorsal organs; the light of the abdominal organ cannot then be seen, as the insect rests with its abdomen doubled up against its sternum. If at such time we awake it, the breathing begins, whereon the light appears in its splendor. There are two kinds, or rather two degrees, of luminosity, one soft, the other bright, which may be termed respectively the cell-light and the tracheal-light. One may change into the other just as the dull glare of a smith's coals will on the action of the bellows develop into a bright flame. In the abdomen the lateral parts begin earliest to shine, and retain their luminosity the longest, because they occupy the place nearest the lateral tracheal trunks. During flight the abdominal organ is in constant activity (here differing from Lampyridæ in which the light is intermittent). In a dark room the light appears clear green, inclining to blue; in daylight it is yellowish. The spectrum analysis has not been satisfactorily effected; but the light seems to produce a spectrum wanting half the blue and deficient in the red. An extracted luminous organ will continue to give red light for some hours (for twenty-four hours if kept in moist air). No light-nerves were found, and so far there was no evidence of the luminosity being under control of the will. It is said that in Lampyridæ the will and the nervous system control the light. In Cucuyo the abdominal light at least depends only on the respiratory center, which is in the metathoracic ganglionic mass. The expiration only of the abdomen is active, and the inspiration is the passive act of the abdominal muscles returning to their place of rest. On every such inspiration the air brought by the tracheæ causes the luminous organ to give its bright, steady light. It is manifest that the light depends on a process of oxidation. All experiments, mechanical irritation, chemicals, or electrical stimulus never succeeded in exciting more than the mild cell-light. But a stream of atmospheric air, and especially of oxygen, brought out the brilliant tracheal-light. The gases were introduced through a glass cannula inserted in a stigma. For the continuance of the light both oxygen and moisture are favorable. The luminous process goes hand-in-hand with the production of a greenish-yellow substance which is found dif-

fused in the luminous cells; and this yellow can be fixed. Our author holds that a substance is produced in the protoplasm of the luminous organ, which on contact with oxygen burns and becomes luminous. The ashes produced are rich in phosphoric acid, from which he concludes that there is a burning of some phosphorous body; and thus both in aspect and in nature it corresponds with the light of a lucifer match.—*G. Macloskie.*

THE DISTRIBUTION OF DERIVED PLANT-PIGMENTS IN CERTAIN LARVÆ.—In a paper in the Proc. Roy. Soc. (No. 237, 1885, p. 269), I gave an account of the way in which altered plant-pigments take part in larval coloring. The evidence was chiefly derived from an examination of the strongly-colored blood of many pupæ; but some larvæ were also investigated, and it was found that the green ground color of many species (especially Noctuæ) was due to the derived green pigments dissolved in the blood. At the same time it was argued that in other species (green Sphingidæ, etc.,) the pigments passed from the blood into the hypodermis cells, and so colored the larvæ. This latter conclusion seemed certain, although it had not been experimentally investigated, because I was working at the subject at a time of year when I could only obtain Noctua larvæ. I was therefore uncertain whether the color of the blood assisted in producing any of the ground color in those larvæ in which the color was also segregated in the hypodermis cells. During the past year I investigated the subject in the larva of *S. ocellatus*, and I found that the blood is only very faintly tinged with derived pigments, and that it cannot produce any effect upon the larval appearance until it has been collected in the superficial cells. It is probable that in such larvæ the modified plant-pigments are slowly passing from the digestive tract to the hypodermis cells through the medium of the blood, and that the blood itself at no time contains a large quantity of pigment. Before pupation the pigments are withdrawn from the cells, and are dissolved in the (pupal) blood, which therefore possesses a concentrated solution of all the pigments that have passed through this medium during the whole of larval life, except those which have been destroyed (if any). Such conclusions render it probable that the most complete demonstration of the vegetal origin of the derived pigments will be a matter of great difficulty, for the amount that passes through the digestive tract as the result of any one meal must be very small, and probably even less could be obtained by carrying on artificial digestion outside the body of the larvæ. And this is likely to be the case with the larvæ in which the blood itself retains all the pigments which have passed through the walls of the digestive tract, for in these larvæ it is probable that only a minute quantity passes through as the result of any one meal. Furthermore, the fact that the derived pigment is associated with a proteid in the blood renders it almost certain that the processes

of modification and association are the direct results of protoplasmic activity, and not the results of ferments, etc., which have themselves been formed by the latter agency. Hence it is far less likely that artificial digestion could be successfully performed than in the case of higher animals. Nevertheless, there are certain ways in which the problem could be attacked with every prospect of success. (1) There are many larvæ which eject a green fluid from the mouth, and this fluid has the same spectrum as that of the blood (in the instance examined). It is probable that such a solution might be made by artificial digestion. (2) The blood of some large larvæ in which the pigments passed into the hypodermis cells might be investigated at various times after a meal and after fasting, and in this way we might expect to trace corresponding fluctuations in the amount of pigment in the blood, as proved by the spectroscopic examination of equal thicknesses. (3) In the same way the pigments might be examined in newly-hatched larvæ before and also at various times after their first meal, when more extensive fluctuations might be witnessed.—*E. B. Poulton, Trans. Ent. Soc., London, 1886.*

THE FLUID EJECTED BY NOTODONTIAN CATERPILLARS.—This defensive fluid, says Mr. Poulton (Trans. Ent. Soc. London, 1886, 157), as is well known, is ejected from a transversely placed aperture on the ventral surface of the prothorax immediately below the head. He had long known that it was powerfully active, affecting litmus-paper in the most marked manner. During the last summer he found that the fluid causes violent effervescence when allowed to fall upon sodium bicarbonate, and has proved (by the reduction of silver nitrate) that the fluid is formic acid. The smell is also quite characteristic, and affords an indication of the larger proportion of acid present in the secretion. He also states that the freshly-made and moist cocoon of *Dicranura vinula* is powerfully acid to test-paper.

"In September, 1885, I found a few larvæ of *D. furcula* on willow, near Visp, in Switzerland, and I examined them to see if they also would eject a fluid when irritated. It was at once obvious that the aperture was present in the same position as in *D. vinula*, but as the larvæ did not eject any fluid I applied gentle pressure (for this is often necessary in the case of *D. vinula*). To my great surprise a complex form of "gland" was instantly everted through the aperture, consisting of six diverging processes of a light green color, divided into two groups of three each. It will be very interesting to investigate the young stages of *D. vinula* in the light of this observation, for it will then be possible to decide whether the apparatus belonging to the latter is derived from an eversible gland which has ceased to be eversible and has fallen back into the condition with which all such structures must have begun—a simple secretory involution dis-

charging its odoriferous or irritant contents; or whether the arrangement in *D. vinula* is truly ancestral while that of *D. furcula* represents a further advance.

"Since the above was written, I have been informed by Lord Walsingham that a simple prothoracic gland is present in the larva of *Melitæa artemis* and that the structure is everted, and hence becomes very prominent in blown larvæ. Lord Walsingham considered that the secretion was of use to the larva in moistening its food. On looking through the collection of preserved larvæ we also noticed other instances of the gland (*e. g.* in the genus Catocala, etc.), so that it seems probable that the structure will be found commonly in larvæ. Hence it appears that the defensive secretion and modified gland of the genus Dicranura are a specialization of an organ which is probably used for a very different purpose by many other larvæ. Although the gland of *D. vinula* seems to be intermediate between that of *D. furcula* and of other larvæ, I think it probable that the ontogeny of the former larva will show that its gland at one time possessed all the complexity observed in that of *D. furcula*."

[We have observed that the larva of *Lochmæus tessella* Pack., when disturbed, sends out from each side of the body a shower or spray of clear liquid. A hasty examination of living and dead specimens has failed to show us the exact opening, which must be in the lower anterior part of the prothoracic segment.—*A. S. P.*]

Peculiar subcutaneous Organs in the Caterpillar of Catocala.—At the meeting of the Entomological Society of London, for April 7th, Mr. William White exhibited preserved specimens of the larva of two species of Catocala, for the purpose of calling attention to some remarkable processes upon the under side, which seem to have been unrecognized hitherto. He stated that, having lately submitted to a microscopical examination the characters on the under side of lepidopterous larvæ of numerous groups, he found this new character to exist in the case of the Catocalidæ, but in no other family. Upon the lower side of the English species, *C. fraxini*, there are curious markings of a *fleur-de-lis* shape between the legs of the second and third thoracic segments, and a further series of marks of various forms upon the third, fourth, fifth, sixth and seventh abdominal segments. These markings are of a dark mahogany brown color, fading into deep orange all round, and in connection with these there is found to be (when examined with a strong lens) a development of some strange processes of a pocket-like appearance. Upon attempting to insert the point of a fine pin into this pocket he found that they were subcutaneous, and not actually upon the surface as they appeared through the perfectly transparent cuticle to be. The German species of *C. alacta* attains an extended and rather

fuller development than *C. fraxini* in bearing the characters upon such segment. The processes vary considerably in grade of development amongst the segments, and he said he had not yet been able to make out their precise order, but he submitted a somewhat rough sketch of the appearance of the abdominal segments of *C. alacta* as shown by a two-inch objective. The first drawing exhibited the internal structure of the dissected portion before the fatty tissues were removed; but little of the processes could be made out from that point of view, and they were more clearly to be seen from the other aspect; also a side view showing the contour of the natural size. The large view of four of the spots presents an idea of the diversity of form in the individual animal, and the two additional sketches show the processes diagrammatically. Mr. White said that 'the only conclusion he could arrive at respecting them was that they were functional organs of a special nature, and he observed that he should be very glad if any one present could suggest an explanation of any such function, or throw some light upon the question of their purpose. Although the whole of the viscera and other fatty portions of the caterpillar had been squeezed out, these organs were perfectly retained, apparently in their proper form, and it was quite certain that they must fulfill some purpose.

In reply to some observations from Professor Meldola, Mr. White said he had not found any similar organs in any other species, though he had looked well for them; and in reply to Mr. J. Jenner Weir, who suggested that they might act as suckers, he stated that the objection to that explanation was that the skin covering them was perfectly tight. There were in some instances pairs of minute holes which might communicate with the atmosphere, and probably did, but otherwise air was closed from them. There appeared to be a motile closing of the arrangement of tentacles like the clasping together of fingers, but this could not apply to the open continuation of the serrated edge of tentacles above this seam of the lip, which is not unlike the labellum of some orchid.

The Darkening of the Hairs of the Larva of Acronycta before Pupation.—During the past summer (1885), I noticed that the long white hairs of this larva become dark, as well as its body, before pupation, when the organism is wandering about to find a place in which to burrow. I then remembered that I had often previously observed the same thing with this larva obtained plentifully upon birch and alder in the near forest. As the larva wanders over the bark, and subsequently burrows in it, the dark color is of great protective use, and is another instance of the utilization of the incidental changes of color before pupation. Previously, during larval, life, the organism rests motionless in a curved position on the under side of the leaf, and the body is almost completely hidden by the long white hairs, and the effect

is that of a convex mass of white silk spun on to the under side of the leaf, resembling, in fact, a cocoon, or more probably the convex white egg-case spun by a spider. But such an appearance becomes very much the reverse of protective as soon as the larva moves, especially upon a dark background, and the darkening of the larval body alone would be useless, because the hairs form its most conspicuous feature.—*E. B. Poulton, Trans. Ent. Soc., London, 1886.*

An Eversible "Gland" in the Larva of Orgyia.—"I do not know whether this structure has been previously noticed; it is not mentioned in the well-known text-books. The single gland to which I refer is situated in the median dorsal line of the seventh abdominal segment, and it is everted when the larva rolls up on being disturbed. The larval surface close to the lips of the aperture seems to be extremely sensitive to tactile impressions." On reading the foregoing note by Mr. E. B. Poulton in the Transactions of the Entomological Society of London (1886, 159), in reference to the European *O. pudibunda*, I at once turned to several larvæ of *O. leucostigma*, and found, what I had not before observed, that the two coral-red tubercles on the back of the sixth and seventh abdominal segments of that caterpillar are on irritation of the animal plainly eversible; when the caterpillar is at rest they are often one-half as short as when disturbed, and the tip is flattened or deeply hollowed; on irritation the end is everted and becomes rounded and conical; over the upper half are scattered three or four short, fine setæ. While walking, the tubercles are only partly exserted, and the edges are usually in motion, slightly everting and retracting.—*A. S. Packard.*

Entomological News.—In the Transactions of the Entomological Society of London for 1886, part II. Mr. E. B. Poulton publishes farther notes on lepidopterous larvæ and pupæ, including an account of the loss of weight in the freshly-formed pupa. This loss is stated to be "immense," but the experiments are not intended to indicate the normal loss of weight in pupæ throughout the quiescent period, although it was necessary for the purpose of comparison, to obtain an approximate average of the rate of normal loss in the species investigated. The normal loss has already been investigated by Meldola.——In the same part (Proceedings) Mr. J. W. Slater read a paper on the genesis of color in insects, in which he maintains in opposition to Grant Allen, that carnivorous insects are not inferior in beauty to flower-and-fruit-haunting groups," and that Mr. Allen's theory of the origin of brilliant coloration is not sustained by an examination of even moderate extent. "We find," says Mr. Slater, "abundance of flower and fruit-haunting species dull and sombre in aspect; an equal abundance of Carnivora and refuse-devourers richly and brilliantly clad; we find groups of species closely simular in color yet quite

opposed in their diet, whilst other groups again, alike in their food, signally differ in their coloration."——Dr. Horn's elaborate monograph of the species of Chrysobothris inhabiting the United States, gives the result of a great deal of labor, both with the pencil and pen; the plates are most excellent and rich in details.

ZOÖLOGY.

HAIR-LIKE PROCESSES ON GLANDULAR EPITHELIUM.—Tornier describes in *Arch. f. Mikrosk. Anat.* for June, 1876, hair-like appendages found on the glandular epithelium in the stomach and renal tubules of vertebrates (Amphibia, lizard, rabbit, and mouse). The difficulty of detection, and especially the circumstance that these exist only at the time when the glands are actually secreting, has hitherto prevented their discovery. They differ from cilia by being smaller, not yet detected in constant motion, and in their fugitive character. Doubtless they are somehow connected with the function of secretion.—*G. M.*

ORGANS OF FLIGHT.—M. P. C. Amans sums up an extensive survey of the organs of flight of the animal kingdom by distinguishing two principal types of the machine—the insect and the vertebrate. In the former the principal part is formed by the meso and metathorax; in each segment the endosternum forms the longitudinal axis of the floor; the flanks are sustained by three vertical pieces, and the upper edge by two; the roof of each segment is formed by two parts, which are concave below and without. The frame-work of the wing is formed by six primary nervures and their ramifications, which are alternately related to the sides or the roof; the general form of the wing is that of a biplanar triangle, with the base centripetal and the apex centrifugal. The base is formed of an anterior and a posterior plane, the latter being the more developed; the base of the wings united to the flanks and to the roof of each segment by as many articular pieces as there are nervures. The apparatus of formation is constant, and may be considered as consisting of an anterior piece, which forms a movable pivot, separated by an articular cavity from the fixed pivot. The wing is able to undergo torsion, thanks to the articulations of the anterior and subanterior nervures with their basal terminations. The line of torsion is a nerve which passes through the basal head of the posterior nervure by a special commissure, and through the basal extremity of the proanterior process when it is stretched. The centrifugal extremity of the wing follows in air and during ascent the course of a sinuous line. The wing is never comparable to a simple lever; it is most nearly so in the Pseudoneuroptera; the basilar pieces (including the roof) may be grouped under three sides of a cone of revolution, and the muscles are grouped according to these; the muscles vary greatly in direction, and it is not correct to speak of exclusively vertical or horizontal muscles.

The bat and the bird are the types of the vertebrate machine; in them the hard pieces are internal, the motors external, and this is the fundamental difference between the two types. The general form of the machine and of the wing, and the distribution of consistency to the surface, as well as the rotation of the anterior edge, is comparable to what is seen in insects.—*Journ. Roy. Micr. Soc., April, 1886.*

UNUSUAL ABUNDANCE OF AURELIA AURITA.—From the 1st of July until the 10th, *Aurelia aurita*, the common large jelly-fish, abounded in enormous numbers in Casco bay, Maine. They were gathered into shoals, for at least hundreds of yards in extent, many of them in a dying condition, floating on their backs, and causing calm areas and streaks when the surface of the bay was elsewhere ruffled. At high water they stranded on the shore, forming patches four or five yards wide and hundreds of yards long, closely packed together, and often two deep. I have never through twenty years' observation seen this species in such great abundance.—*A. S. Packard.*

THE LEECHES OF JAPAN.—A recent account of the leeches of Japan, by Dr. C. O. Whitman, in the *Quarterly Journal of Microscopical Science*, is illustrated by colored drawings by Mr. Nomura, a young Japanese artist. That the Japanese can make excellent zoölogical artists is shown by Dr. Whitman's remark: "Mr. Nomura's attention to the minutest details, his infinite patience, trained eye, and his remarkably skillful brush, have given results that are marvels for neatness and accuracy." The Japanese land leech is, among others, the most interesting from its habits. It is confined to the mountain slopes and ravines, never descending into the plains. It is not only a mountain leech, but it keeps habitually to the ground, living in moss or under damp leaves and rubbish. They are most voracious, and on the approach of man or beast are at once on the alert. They advance by rapid strides. They bite so gently as scarcely to attract attention; but the wound is deep, and the scar is more or less permanent. They gorge themselves for about thirty or forty minutes and then drop; while sucking they become bedewed with a transparent liquid, which keeps them moist. If placed in water, they do not swim, but sink, and then creep out, and while having a decided preference for a terrestrial life, can support life for days in water. If into a jar of hungry leeches a puff of breath is blown, they become much excited, and it will be difficult to keep them in; while trying to keep back one, a dozen others will get out. The geographical area of land leeches is mainly within the tropics, though in Japan they are exposed to a wide range of temperature. A new medicinal leech was discovered, well known to the Japanese, and with habits just like the European leech. In these leeches the segmental organs are shown to be sense-organs, and the

author believes that from them the eyes have developed, so that he regards them as incipient eye-spots.

Some Notes on Bird Migrations.—The City of Chicago is perhaps not the most favorable locality for observing the phenomena attending the annual flight of the birds, but with its abundance of fine parks and pleasant suburbs, it still presents some facilities for the ornithologist to pursue his favorite study. On March 24th, 1886, I visited, for the first time, Oakwood cemetery, situated about seven or eight miles south of the center of the city. It is a somewhat extensive enclosure of slightly undulating ground, well set with trees, many of them evergreens, which have attained to considerable size, and also containing quite a number of natural growth of still larger dimensions. The evergreens, so rare in the prairie region, render it at once a favorite resort for various species of the feathered race. At the time of my first visit, there was still a thin covering of snow on the ground, and signs of spring were not abundant. The trees, however, were well stocked with birds; tree-sparrows and snow-birds being, as might have been expected, very numerous. The most conspicuous figures of the population, however, were the blue-jays, which were present in greater numbers than I ever saw before on the same area. "Here," thought I, "is the favorite home of the jays, where they can get the protection of the evergreens, which the native forest denies, and breed undisturbed;" for shooting and birds-nesting are forbidden on that sacred ground.

For two weeks after my first visit the number of jays appeared undiminished, but as soon as signs of returning warmth were more apparent, I noticed a decided diminution in their ranks, till by the first of May not more than two or three pairs were left; and indeed it may be questioned whether these were not new-comers from some more southern point, while the original stock had all gone further north. It seems evident from this, as has been suspected before, that the jays, as well as others of our so-called "resident" species, are, to some extent, migratory, only within narrower limits than the great mass of birds. It would appear that the thick evergreen trees and the immunity from disturbance acted as an attraction to induce the jays to seek this place to pass the winter, so that they were collected here in far greater numbers than would ordinarily be found on any other corresponding area. It may be that at the approach of the breeding season they simply scatter themselves over the adjacent country, but as the land in that vicinity is, for the most part, devoid of trees, it seems much more probable that they go north to the more heavily timbered regions.

On April 17th, while visiting this cemetery and some other suburban fields, my attention was attracted by the great number of golden-winged woodpeckers or flickers, everywhere to be

seen. Nearly every tree was occupied by one or more, and they were continually flying back and forth and calling to each other. They were, moreover, remarkably tame, and could be approached to within a distance of ten or fifteen yards. As I passed through a long narrow strip of low woodland, or grove, a dozen of these beautiful birds continued to fly from tree to tree not more than a pistol shot in front of me, until I had driven them the whole length of the grove, a distance of a quarter of a mile, when they took flight to another piece of wood a little further on. On April 23d, I again visited the same localities and not a single flicker was to be seen; and in a somewhat thorough search of the surrounding country, embracing an area of two or three square miles, I did not find a solitary specimen of the bird, either at that time or for a month after. A more complete "wave of migration" could hardly be imagined.

On April 9th, the city and suburbs were visited by a great number of yellow-bellied woodpeckers (*Sphyropicus varius*). They were to be seen on the trees in the yards and on the telephone poles along the streets, and my little son brought me a pair that had evidently been killed by flying against the telephone wires. For three days this invasion continued, and then all disappeared, and not another specimen was seen during the spring.

On my visit to Oakwood cemetery on April 17th, chewinks of both sexes were abundant. Six days later none were observed, and since then only an occasional specimen. The same fact was also noticed in regard to the white-throated sparrow (*Zonotrichia albicollis*). On April 23d the first were seen, and they were in swarms; within a week they too passed away, and only now and then a stray individual or pair were found.

On April 29th the redheaded woodpeckers (*Melanerpes erythrocephalus*) were first observed, and appeared in considerable numbers. On May 1st, wishing to secure a few specimens of this species, I again repaired to the same locality with my gun, but though I tramped over miles of woodland, I only saw a single individual, and that one was so wild and shy that I failed to secure him. The "wave" had passed on.

That the migrations of birds take place in pulses or waves has long been noticed; but I have never observed or heard of cases so well marked as those cited above. It would seem that this cemetery presents such exceptional advantages as a resting place, affording protection both from the barbarity of man and the inclemency of the weather, that it is selected as a way-station for various species, where they remain for a few days and recruit their exhausted energies preparatory to their farther flight northward.

The building of the Board of Trade of Chicago has a ring of electric arc lights around its dome, some three hundred feet above the pavements. The ring is thirty feet in diameter, and contains

twenty lights. They were lighted for the first time on the evening of January 1st, 1886. On the night of May 8th following, a terrific thunderstorm passed over the city between the hours of 11 P. M. and midnight. During the storm the attention of the few people who were on the street at that time was attracted to the spectacle of a great number of birds hovering about this ring of lights and dashing at them. In the morning it was discovered that hundreds of dead birds were scattered about the foot of the tower, and hundreds more were found upon the roof of the building. When the workmen ascended the tower to renew the carbons in the lights, they found many of the globes occupied by the bodies of birds, some containing as many as eight, and many of the carbons had been broken off by the birds. Over two hundred bodies were picked up by one of the workmen attached to the building, which was but a small part of those carried away by the news-boys and others in the morning. A person who saw them before any were taken away, estimated that more than a thousand were killed. But even this was but a small portion of what were seen in the air about the tower. It is to be regretted that no person competent to determine the species of the birds killed on this occasion, was present when they were first observed. I understand that a few of them afterward fell into such hands, but I have heard no report. From the testimony of those who saw them they appear to have been, for the most part, the smaller song-birds.

The question arises, why was this great number of birds attracted on this particular night, when, during a month previous, while the migration was going on, no birds had been seen near the lights. It may be that they had been driven from their course by the storm, and so brought in contact with the dazzling beacon; or, perhaps, as birds are known to fly at great heights when migrating, the storm caused them to fly lower, and so brought them within the fatal influence. But several other storms of nearly equal violence had taken place in the night time within the two months of April and May, and with no similar attendant phenomena. The most reasonable conclusion, then, seems to be that the storm on the night of May 8th was coincident with a "wave" of bird-migration; that the birds flew low to get beneath the low-hanging clouds and avoid the violent winds of the upper atmosphere, and so were brought into the vicinity of the lights, and, in the intense darkness of the storm, were bewildered with the glare, and either rushed to an untimely fate, or fluttered helplessly about until the storm passed away, leaving the sky clear so they could see to pursue their journey.—*F. E. L. Beal.*

BAMBEKE ON HEREDITY.—The same *Bulletin* contains an interesting paper by M. Ch. Van Bambeke, on heredity, in which the theories of Darwin, Haeckel, Nägeli, Pflüger and others are sub-

jected to a searching criticism. Both pangenesis and plastidul-perigenesis are rejected as inadequate to explain all the phenomena of heredity, which, it is argued, can be accounted for only by supposing that the germ, Weismann's *Keimplasma*, is in fact continuous. It is not to be regarded as the final outcome of the ontogenesis of each individual, but passes from parent to offspring directly, being from the first present in an unmodified form in a large number, possibly in all the comatic cells. The germinative plasma persists through certain cellular series, concentrating itself anew in the embryonic cells of the new organism. In a word, in the phylogenetic development of the organisms the germ, whose true seat has now been determined, is perpetuated throughout the whole series of successive ontogenies. The generations succeed and efface each other, the Keimplasma alone is immortal. —*Nature, April 1, 1886.*

Domestication of Wild Fowl.—The domestication of our beautiful wild fowl has for years been one of my hobbies; and some years ago, while living in Western New York, I hatched a brood of wood-ducks, which gradually disappeared one by one while I was away attending to other business, and the loss was attributed to rats or weasels. Circumstances prevented my indulging in this taste until three years ago, when I took it up again. I bought a flock of wood-ducks in 1883 and a mink killed them in March following. The next year I bought eighteen pairs of wood-ducks, but did not get an egg; attributed to keeping them confined in close quarters at night, and to feeding them on corn. This year the birds, which have been on the ice every day during the winter, were not confined at night after February, and were fed on buckwheat, wheat, watercress and clams, seem to be in excellent order, and paired off early. Nests were put up for them in boxes and nail kegs, three or four feet above the ground, and a great amount of inspection and house-hunting was done by them, and hopes were entertained that they would lay. One duck laid three eggs and stopped, these were set under a hen, but not one was fertile.

A pair of pintails presented to me by a gentleman in Montana, who caught them in the spring of 1884, have not yet laid. The male has shown a desire to increase his species, but his mate has paid no attention to his advances.

A pair of Chinese mandarin ducks imported by me two years ago, when they were a year old, have bred. From seven eggs put under a hen on the last day of June I had four ducklings on July 29th and three infertile eggs. These young birds at the present writing are strong and lively.

I have so far been unable to get green-winged teal, although I have offered prices which should tempt men who send these birds to market.

The eggs of the above wood-duck and the mandarin are from two inches to two and one-eighth in length, and one and a-half inches in depth. They vary some, and at first I thought I could distinguish the egg of the wood-duck from the mandarin's by its being more pointed, but the variation has been such that I do not feel at all confident of this.

Next season I shall enlarge my range, and make every effort to obtain other species, and to breed them.—*Fred Mather.*

ZOOLOGICAL NEWS.—*Mammals.*—Mr. Carter, of the London Colonial Exhibition, states that mice are among the enemies of frogs. He was a witness to an attack made by mice upon some frogs which infested a barn. They pursued and bit the batrachians, which had sufficient strength and alacrity to escape, but were again pursued and caught, until they were helpless from the severity of the bites, when the mice ate a portion of them.—— M. F. Lataste describes (Ann. d. Mus. Civ. d. St. Nat. Gen., 1882–83) a new species of Jerboa (*Dipus darricarrerei*) from Algeria. Two other species, *D. ægyptus* and *D. hirtipes*, occur in the same region.

Birds.—Sr. T. Salvadori enumerates fourteen species of Megapodes in Papua and the Moluccas. These constitute a majority of the Gallinæ, the remaining forms consisting only of four Perdicidæ and *Turnix melanonota*. The Grallatores of the same region number seventy, viz: Rallidæ, 17; Glareolidæ, 2; Hæmatopodidæ, 2; Œdicnemidæ, 1; Charadriadæ, 8; Parridæ, 1; Scolopacidæ, 19; Ardeidæ, 17; Ciconiidæ, 1; Ibidæ, 2. Though most of these waders are widely spread, thirteen are peculiar to the region, or to parts only of the region. The Natatores of the same islands are forty-one, viz: Anatidæ, 6; Pelecanidæ, 11; Laridæ, 15; Procellaridæ, 7; Podicipidæ, 2. Two only, *Dendrocycna guttata* and *Podiceps tricolor*, seem to be peculiar to the region.——Sr. T. Salvadori (Ann. d. Mus. Civ. d. St. Nat. Gen., 1884) occupies 276 pages with an account of the birds of Shoa collected by Antinori. They include 307 species: Rapaces, 42; Psittaces, 3; Picariæ, 52; Passeres, 130; Colombæ, 9; Gallinaces, 5; Grallatores, 44; Natatores, 22. The proximity of Shoa to Abyssinia, the bird fauna of which has been so well explored by Ruppell, Heuglin and others, did not give hope of many novelties, yet at least five are new: Caprimulgus, 1; Psalidoprocne, 1; Euplectes, 1; Textor, 1; Podiceps, 1, and possibly two or three more. A few of the species belong to the fauna of the south of Africa, and have now first been met with north of the equator, while two species (*Platystira albifrons*, *Cryptospiza reichenowi*) have previously been considered peculiar to the west of Africa.

Reptiles.—*Proteus anguineus* is not, it appears from the statements of Dr. Marchesetti, confined to Carniola, but occurs also

in Friuli, and has been found in the Istrian peninsula, in a stream of water running through the gallery of a lignite mine excavated in cretaceous strata.——*Nature* states that a very large Ascension turtle which recently died at the Colonial and Indian Exhibition, London, had existed without food for more than two months, and contained 100 eggs, the retention of which was the probable cause of death.——Mr. W. A. Carter, of the fisheries section of the same Exhibition, placed some small tortoises, 1¼″ long, of what kind is not stated, along with some frogs of about the same dimensions. The tortoises at once attacked the frogs, and bit pieces from the legs, repeating the operation afterwards.

Fishes.—D. Vinciguerra (Ann. d. Mus. Civ. d. St. Nat. Gen., 1882–83) describes the fresh-water fishes brought by the Italian Expedition to Equatorial Africa (Shoa), two of which, one of Haplochilus and one of Discognathus, are new.——The annals of the Genoa Civic Museum of Natural History (1882–83) contain an account of the ichthyological results of the cruises of the *Violante* in 1877 and 1880. The total number of species taken was 119, of which probably three, and certainly two, are new. These are *Gobius vittatus* Vinciguerra, taken on the north-east of Sardinia; *Blennius nigriceps*, taken near the island of Brazza, and a doubtful Exocætus.——Sr. Vinciguerra describes in the same volume the ichthyological results of the cruise of the *Corsair* around Madeira, Arnecife, Teneriffe and the Canaries. Only six of the thirty-five species do not occur in the Mediterranean.

Crustacea.—Mr. S. I. Smith (*Ann. and Mag. Nat. Hist.*, March) gives an account of the Decapoda dredged by the *Albatross* in 1883–85 from depths above 1000 fathoms. Of the forty-four species twenty-one inhabit the bottom or its immediate neighborhood, while most of the others, though from abyssal depths, are probably not confined to the bottom. Of six species (Acanthephyra, 3 sp.; Sergestes, 2 sp., *Pasiphaë princeps*) it is concluded that, though contained in the trawl coming from great depths, they are not truly abyssal.——*Parapagurus pilosimanus* has been dredged at various depths from 250 to 2221 fathoms. In the shallower depths it inhabits the carcinœcia of *Epizoanthus paguriphilus*, but in more abyssal localities some tenant the house made by *E. abyssorum*, others naked gastropod shells, and still others an actinian polyp, apparently *Urticina consors* Ver.—— The abyssal Decapoda are among the largest of their respective groups. *Geryon quinquidens* is one of the largest brachyurans; *Lithodes agassizii* measures three feet across the outstretched legs, and six across the carapace; *Munidopsis bairdii, crassa* and *rostrata* are the largest known Galatheidæ; *Sabinea princeps* is probably the largest Crangonid, and two Penæidæ are about a foot in length.

Echinoderms.—M. Perrier has again attacked the so-called

heart of echinoderms. His study of *Asterias hyadesi*, a new star-fish from Cape Horn, has led him to conclusions identical with those arrived at from the study of Comatula. The "heart" in Comatula is but a glandular organ, the point of departure of the reproductive organs, and there are no true vessels, only irrigation canals in which sea-water always runs. Part of the water which enters by the madreporic plate of Asterias passes into the sub-ambulacral cavities, the schizocele, and the genital cavity. Sea-water plays the part of blood not only in echinoderms, but in all zoöphytes, which M. Perrier believes ought to form a sub-king dom, as arranged by De Blainville.

Vermes, etc.—W. Bateson (*Quart. Jour. Mic. Sci.*, 1886,) gives a continued account of the later stages in the development of *Balanoglossus kowalevskii*, and of the morphology of the Enteropneusta. This is followed by an article upon the ancestry of the Chordata in which he endeavors to clear away the difficulty interposed by the unsegmented condition of the Enteropneusta to their right to a place among the vertebrate ancestry. He holds that repetition of organs and sets of organs is of common occurrence among animals, but that, however far back a segmented ancestor of a segmented descendant may possibly be found, yet ultimately the form has to be sought for in which these repetitions had their origin.——The Bolletino of the Adriatic Natural History Society contains a list of the fauna of the Adriatic by Michele Stossich. The Cœlenterates are included in Vol. IX, No. 1, 1885.——M. Stossich (Boll. d. Soc. Adri. d. Sci. Nat. 1885) gives an account of various species of Distomum and allied genera found in the intestines of fishes in the neighborhood of Trieste.

EMBRYOLOGY.[1]

THE DEVELOPMENT OF THE MUD-MINNOW.—The ova of *Umbra limi* measure 1.6^{mm} in diameter and are laid singly upon aquatic plants to which they adhere for a time by means of a thin coating of adhesive matter which invests them. The vitellus and blastodisk is moderately clear and yellowish in color. Just underneath the blastodisk there is a rounded, flattened cluster of highly refringent oil-drops of small size. As the blastodisk spreads these oil-drops become more and more diffused or scattered over the vitellus just beneath the blastoderm.

At the time of the formation of the blastodisk, the vitellus displays a most active amœboid activity of its substance. This is so active that the outline of the vitellus changes very distinctly at intervals of a few seconds. In fact, I know of no teleostean egg which has been hitherto described in which such amœboid movements of the vitellus are so pronounced and rapid.

[1] Edited by JOHN A. RYDER, Smithsonian Institution, Washington, D. C.

The young mud-minnow leaves the egg on the sixth day, at which time it measures 5^{mm} in length. A bilaterally symmetrical net-work of blood-vessels is developed beneath the outer sac covering the vitellus, the blood-channels being excavated in the periblastic and cellular splanchnopleural covering of the latter. The oil-drops soon rearrange themselves on the anterior, lateral and ventral aspects of the vitellus. Three days after hatching the air-bladder becomes apparent as a fusiform vesicle behind the pectorals and above the foregut, when the young fish is viewed as a transparent object.

Pigment is rapidly developed upon the upper and lateral aspects of the body, and by the sixteenth day the larvæ have become pretty dark in color, when observed from above.

Immediately after hatching it is observed that there is a small projecting lobe at the end of the tail. Into this lobe the notochord extends. This terminal lobe of the tail is much narrower than the portion of the caudal lobe just in advance of it. As development proceeds it also becomes longer and more conspicuous. This terminal lobe of the tail of the larval mud-minnow is clearly homologous with the *opisthure* of the larval Lepidosteus and the adult *Chimæra monstrosa*. It is certain that it is subsequently absorbed, since the more advanced stages prove that the rays of the permanent caudal fin are developed far in advance of the opisthural lobe above described.

There is a slight tendency to form an opisthural lobe in the larva of the pike, but the larva of none of the teleostean forms hitherto studied approach the Rhomboganoids so closely in respect to the manner in which the tail is developed as Umbra.—*John A. Ryder.*

The Development of Fundulus heteroclitus.—The embryology of this oviparous cyprinodont fish differs very considerably from that of the viviparous types, such as Gambusia and Anableps. Features which are especially noteworthy are the presence of a well-developed zona radiata, which is thickly covered with very fine filaments, such as are found on the eggs of *Belone longirostris*, but much finer. The writer is not aware that any such filaments have hitherto been detected on the eggs of any Cyprinodont. As in the cases of Belone, Exocœtus, Menidia, etc., these filaments intertwine with those of adjacent eggs, so as to bind the latter into masses or clusters which lodge upon algæ, etc., and thus suspended receive more or less protection during their development. The ova of *F. heteroclitus* measure nearly a line in diameter, and develop in sea-water in about twenty-four days, at a temperature ranging from 55° to 63° Fahr.

The oil-drops are small and numerous, and are embedded in the vitellus, a little to one side of the blastodisk, and are gradually carried over the surface of the yolk as the blastoderm spreads. —*J. A. Ryder.*

OBSERVATIONS ON THE EMBRYOLOGY OF SPIDERS.—Some work done during the past winter on the embryology of several species of spiders at the biological laboratory of the Johns Hopkins University brought to light some facts of general interest.

The origin of the lung book of the spider is particularly interesting, in view of the comparisons instituted between Limulus and the arachnids. From good longitudinal sections of the spider embryo before the disappearance of the abdominal feet, it appears that the lung book may fairly be regarded as an involuted appendage or appendages. Before the involution of the abdominal appendages, the epithelium covering them assumes the characters of the epithelium of the lung book. At the same time the appendages become less conspicuous, and slight folds appear on their anterior faces.

By the complete involution of the abdominal appendages, and the increase in the number and distinctness of the folds on their anterior faces, a lung book would be formed with its laminæ directed backwards. All the stages of the process of involution were not observed, but probably in the species of spider upon which the most complete observations were made two pairs of abdominal feet are involuted.

Whether the conversion of the abdominal feet into the lung book is to be regarded as an involution of certain paired appendages, as was suggested by Lankester on theoretical grounds, or as a portion of the abdomen over which an appendage corresponding to the operculum of Limulus extends, could not be positively determined.

There appears, from one series of sections, to be a swelling corresponding in position to the operculum of Limulus just in advance of the involuted abdominal appendages.

Another point of interest in arachnid embryology is the presence of a fold in the blastoderm, surrounding the cephalic region of the embryo. Balfour described this fold as a groove. It appears, however, when studied by transverse and longitudinal sections to be a fold of the blastoderm. At the anterior extremity of the fold its opposite sides unite over the median line of the embryo, so that the brain is partially invested by an outer sheath or bag of epiblast formed by the united inner limbs of the opposite sides of the fold.

The origin of this fold and the union of its opposite sides over the middle line of the embryo correspond to the amnion of insects. The difference between the insect amnion and the spider amnion lies in the fact that in the former the union of the opposite sides of the amniotic fold is in most cases complete throughout the length of the embryo, while in the latter the folds are developed only in the head region of the embryo and coalesce at their anterior ends.—*A. T. Bruce, Ph.D.*

PHYSIOLOGY.[1]

THE DELICACY OF THE SENSE OF SMELL.—The sense of smell is probably the leading sensorial endowment in most insects, and it does for them what sight and hearing do for man. Its potency in helping along intelligence is very great, since we know that mentally insects stand at the head of the invertebrate, as man stands at the head of the vertebrate world. The sense of smell is probably acute in some fishes, as, for example, the shark: this is the most active if not the most intelligent of fishes, and it has an olfactory mucous membrane which if spread out would cover some twelve square feet. The sense falls in value in the Amphibia, reptiles and birds, but rises again in the Mammalia, though not in proportion to intelligence. Its extreme acuteness in the dog, the most intelligent of animals short of Quadrumana, is well known. In man, the sense of smell is subordinate, and even rudimentary. Olfaction adds to man's enjoyment, preserves him from some dangers, but does not very much extend his knowledge of his environment.

Yet despite the comparative insignificance of this sense in man, its delicacy is most marvelous, and by it we can appreciate more minute subdivisions of matter or the impact of more infinitesimal molecular vibrations than by any other of the avenues to the brain.

Professor Valentine has made some interesting and striking experiments in proof of this. He found that a current of air containing 1-30,000 milligramme of bromine, or 1-500,000 milligramme of sulphureted hydrogen, or 1-2,000,000 milligramme of oil of roses could be perceived by the sense of smell. He also determined that the amount of odoriferous air which must pass over the olfactory membrane in order to excite the sense of smell was from fifty to one hundred cubic centimeters (one-tenth to one-fifth of a pint). He calculated, therefore, that the actual amount of bromine necessary to excite a sense of smell was 1-6000 milligramme, of sulphureted hydrogen 1-5000 milligramme of oil of roses 1-20,000 milligramme (about 1-120,000 of a grain).

Two recent experimenters, E. Fisher and F. Pentzoldt, of Erlangen, have found two other substances which far exceed the foregoing in their capacity for affecting the olfactory nerves. These were mercaptan (sulphureted alcohol) and chlorphenol. They found that in air containing 1-230,000,000 milligramme to the cubic centimeter of chlorphenol, and 1-23,000,000,000 milligramme of mercaptan, these substances could be appreciated, and it was estimated that only 1-4,600,000 milligramme of chlorphenol, and 1-460,000,000 milligramme of mercaptan, is necessary to excite a sensation of smell. There exists, therefore, a substance which in so small a subdivision as 1-2,760,000,000 grain, or not

[1] This department is edited by Professor HENRY SEWALL, of Ann Arbor, Michigan.

quite one three-billionth of a grain, is capable of calling out a nerve impulse. This subdivision of matter is quite beyond comprehension, yet the nose alone can appreciate it. The smallest subdivision appreciable by the eye through the spectroscope is 1-1,400,000 milligramme of sodium, which is a two hundred and fifty times coarser division of matter than the minimum of odor-exciting mercaptan.

On account of the extraordinary power of mercaptan it is proposed to put it to some practical use in testing currents of air, ventilation, etc.—*Medical Record.*

PSYCHOLOGY.

CANINE REASON.—S. N. Maxcy, of Gardiner, Maine, has a black-and-tan dog which is very intelligent. He has all the accomplishments a common dog has and knows several besides. The screen door of the house opens outward, and Dick can open it from the outside, pulling it with his teeth. The other day he approached the door with a bone in his mouth. He couldn't open the door while he held the bone, and if he couldn't have the bone he didn't care to open it. He looked at it a minute, then laying the bone down near the door, pulled the door open and went in. He then turned and pushed the door wide open, and before it could swing to again, had grabbed up his bone and got inside.—*Exchange.*

A bird dog owned in this town, though we doubt much if he has been shot over, is in the habit of making furious dashes at the doves feeding in the streets, and of course the birds are too quick for him. The other day he watched his opportunity in this wise. The dog saw the doves, and also saw a team approaching; he waited until the team was between himself and the birds, then he made a tremendous rush between the wheels, and the birds not seeing his first leap were taken in a heap of surprise, and one dove was nearly captured.

Both these cases look a trifle like an exercise of the reasoning power.

Since the above was written (it was prepared for last week's issue) another capital story has come to our knowledge. Dr. C. A. Packard, of Bath, owns a setter of very fine blood, when young a capital bird dog, but too old now to hunt. He runs with the carriage for short drives occasionally. One day when on the road poor "Flash" had the misfortune to nearly tear out one of his nails, and the doctor was obliged to use the bone forceps to remove the nail. Flash stood the operation "like a major," never wincing. Not long after this the doctor heard the well-recognized rap of Flash on the office door for admission. It was opened and in came Flash, accompanied by a small dog with a bad wound upon one leg, and Flash brought the dog up before his

master. The doctor attended to the binding up of the leg and then Flash went out with his little friend, probably seeing him home.—*Brunswick Telegraph.*

[Flash, whom we have known for years, is a well-trained Irish setter, and is a dog of unusual docility and intelligence.—*Ed.*]

ANTHROPOLOGY.[1]

ANTHROPOLOGICAL NOMENCLATURE.—Quite frequently we have drawn attention to the necessity of a consensus among anthropologists as to the technical terms to be used in certain cases, and also to the precise boundaries of these terms. At the suggestion and request of a friend in Ohio, we revert to the subject, and present in the present number a short article on names, by Mr. John Murdoch. Without pretending to legislate upon the subject, we invite the most minute criticism, promising to use the words below defined in the sense given, unless some one offers a sufficient reason to the contrary.

THE PARTS OF ESKIMO HARPOONS.—I have been recently making an extended study of Eskimo harpoons, and in describing this widespread class of weapons have adopted the following nomenclature, which is applicable to all the harpoons used along the northern shores of the new world, from Greenland to the Gulf of Alaska and in the north-eastern corner of Siberia. These harpoons fall naturally into the two following classes:

1. *Toggle-harpoons*, in which the head fits upon the shaft by means of a socket, and is slung in a loop at the end of the line in such manner that, when plunged into an animal, the strain upon the line causes the head to become detached from the shaft and to turn like a toggle across the wound underneath the skin.

2. *Barbed-harpoons*, in which the head fits into a socket in the shaft, holding the animal by one or more barbs, like those of an arrow.

The head of an Eskimo harpoon is always detachable from the shaft, and fastened securely to the line. In the first class the line is often attached temporarily to the shaft, and has fastened to it one or more floats made of inflated seal-skins. This class includes the ordinary *seal*, *walrus* and *whale* harpoons of various sizes and used both for thrusting and darting.

The second class (comprising the so-called "bladder-arrow" of the Greenlanders and the seal and beluga darts of the western Eskimo, used only for darting) always has the line attached permanently to the shaft, which is made to serve as a float, either by attaching an inflated bladder to it or by making the line fast in a martingale, so that the shaft is dragged sideways through the water.

A harpoon of the first class consists of a *shaft*, usually of

[1] Edited by Prof. OTIS T. MASON, National Museum, Washington, D. C.

wood, to the butt of which is sometimes fitted a sharp *ice-pick* of bone, antler or preferably of walrus-ivory. To the outer end is fitted the *fore-shaft* of bone or ivory, which may be simply a ferule of greater or less length, of the same diameter as the shaft, or may be expanded into a heavy pear-shaped knob, so as to give weight to the head of a weapon intended for darting. Into a *socket* in the end of the fore-shaft fits one extremity of the slender *loose shaft*, which is short in a harpoon intended solely for darting, long in one which is to be thrust through a hole in the ice. This is attached to the rest of the harpoon, usually to the fore-shaft, by the *assembling line* passing through holes in each and keeping the loose shaft from being dropped and lost. On the small seal-harpoon the assembling line is frequently long, and knotted also to the shaft and ice-pick, so that if the harpoon breaks the parts are not lost.

The function of the loose shaft is to prevent the harpoon from breaking with a lateral strain, while its play in its socket facilitates the unshipping of the toggle-head. Some harpoons are still made with the fore-shaft and loose shaft in one piece, and the unshipping of the head is provided for by the shape of the lip-end.

On the point of the loose shaft fits the *toggle-head*, consisting of a *body* of bone or ivory in the shape of a slender conoid or hexagonal pyramid with the base beveled off so as to form a long sharp spur, the *barb* of which may be split into two or more *points*. The body is usually somewhat flattened at right angles to the plane of the barb, but in some localities it is very much flattened in the direction of that plane, in which case it often has a pair of lateral barbs near the apex.

In the apex of the body, usually at right angles to the barb, is the deep narrow *blade-slit*, into which fits the broad, thin, sharp lanceolate, or triangular blade of stone or metal. When of metal it is usually secured by one or more rivets. In the middle of the base is the deep *shaft-socket*, and through the middle of the body at right angles to the barb runs the *line-hole*, from which, on each side, deep longitudinal line-grooves run back to the base.

The line may be fastened directly to the head, in which case the end of the line is passed through the line-hole, brought back and secured to the standing part (to use a nautical term) so that the head is slung in a loop of the line. Or the line may be joined to the head by means of a *leader*, or short line, attached as before explained to the head and knotted or spliced at the end into a a loop, the *becket*, in which case the line may be fastened or detached at pleasure.

When the head is fitted upon the shaft the line is brought down nearly to the middle of the latter and either knotted securely around it, fastened with a "slippery hitch" or attached by means of a small loop or ring of ivory to a little peg, the *line-hook*, pro-

jecting from the shaft. The last contrivance is used when the line has a float attached to it.

Harpoons of the second class are more simple. The shaft is never fitted with an ice-pick, but sometimes has feathering at the butt like an arrow. The fore-shaft is usually of greater diameter than the shaft, and its socket receives the *shank* of the head, which has flat *faces*, sharp point and sides, and one or more unilateral or pairs of bilateral barbs. It is usually made of bone or ivory, and the *line* is fastened to it by passing the end through a hole in the shank and tying a knot on the opposite side.

GLOSSARY OF THE HARPOON.

ASSEMBLING-LINE, a line joining the loose shaft of the harpoon to the fore-shaft, or joining all the sections of a harpoon so that if a part is broken off it will not be lost.

BARBED-HARPOON, a harpoon designed to hold the animal struck by one or more lateral barbs on the head.

BLADE-SLIT, a "saw cut" in the front of a harpoon or spear-head into which the blade is fitted.

BODY, the bone or ivory portion of a toggle-head.

BODY-BARB, the sharp spur or spurs in which the body of a toggle-head terminates.

FORE-SHAFT, the anterior end of a harpoon or spear-shaft when made in a separate piece and of different material.

HARPOON, a spear for capturing aquatic animals, designed so as to hold the prey by means of a barbed or a toggle-head. Harpoons may be thrust or darted with the hand or from a throwing stick, and receive a variety of names according to form and special use.

HARPOON-BLADE, a sharp lanceolate or triangular blade of stone or metal forming the cutting portion of a harpoon-head.

HARPOON-FLOAT, an inflated skin or bladder attached to the harpoon, either to the line or to the shaft, to act as a drag on the game.

HARPOON-SHAFT, the wooden portion of a harpoon or, more generally, the entire portion behind the head.

HARPOON-HEAD, the part of the harpoon which enters the animal and holds it by its barbs or other contrivance.

HARPOON-LINE, a line, one end of which is fastened to the harpoon, the other end being either attached to a float or lashed to the shaft or held by the hunter.

ICE-PICK, a "bayonet" usually of walrus-ivory, bone or antler, fitted to the hinder end of a harpoon and used for chipping holes in the ice.

LEADER, a short line fastened to the harpoon-head; to it the line is so attached as to be removable at will.

LINE-GROOVES, furrows on the sides of a toggle-head extending from the line-hole backward, into which the line or the leader fits, so as to facilitate the entrance of the head into the game.

LINE-HOLE, a perforation through a toggle-head to receive the leader on one end of the harpoon line.

LINE-HOOK, a peg on the harpoon-shaft to receive a loop or eyelet in the harpoon-line when the head is in place and the line drawn taut.

LOOSE-SHAFT, a spindle-shaped rod of ivory or other hard substance between the toggle-head and the fore-shaft of a harpoon to prevent the breaking of the shaft

by a lateral strain. It is connected with the fore-shaft or the shaft by an assembling-line. It is short in a darting harpoon and long in one used to strike seals under the ice.

MARTINGALE, a line attached by its ends to the harpoon-shaft near the extremeties, and fastened in the middle to the harpoon-line.

RETRIEVING-HARPOON, a light harpoon used almost exclusively for retrieving seals that have been shot in the water. One end of the line is made fast to the shaft close to the head, the other end is held by the hunter.

SEAL-DART, a barbed harpoon launched from a throwing stick. The line is permanently attached to the shaft which is so mounted as to serve as a float or drag.

SHAFT-SOCKET, a cavity in the base of a toggle-head to receive the front end of the loose shaft.

SHANK, the part of a barbed-head which fits into the socket.

SOCKET, a cavity in the front of a harpoon fore-shaft to receive the barbed head or the loose shaft.

THROWING-STICK, a device for hurling a harpoon or spear. Its essential parts are the groove in which the shaft of the weapon lies and the hook or eyelet to hold against the shaft.

TOGGLE-HARPOON, a harpoon in which the head is fitted to the shaft in such a manner that when driven into the body of the animal it turns like a toggle under the skin, so that it cannot be withdrawn.

TOGGLE-HEAD, the part of a harpoon which enters the body of the animal, turns at right angles and acts as a toggle in preventing escape. It consists of a body and blade. The body is of bone or ivory made in the shape of a slender conoid or hexagonal prism, with the base cut off obliquely so as to form a long sharp spur or barb, which in turn may be split into two or more points.

—*John Murdoch, U. S. Nat. Mus.*

ANTHROPOLOGY IN BRAZIL.—The sixth volume of Archivo do Museo Nacional do Rio de Janeiro, dated 1885, contains the following papers:

Contributions to the ethnology of the valley of the Amazons. I. Sambaquis of the Amazon. By Charles Frederick Hart. pp. 1–174.

The man of the Sambaquis. By Dr. J. B. de Lacerda. pp. 175–204.

New craniological studies upon the Botocudos. By Dr. J. Rodrigues Peixoto. pp. 205–256.

Investigations upon the archæology of Brazil. By Dr. Ladislau Netto. pp. 257–554.

This volume of archivos is a monument commemorative of the Anthropological Exposition of Brazil, opened 29th July, 1882, under the auspices of the National Museum, of which Dr. Ladislau Netto is director.

The first part contains ethnological papers by Prof. Ch. Fred. Hartt, many hitherto inedited, supplemented by his pupil, Orville Dewey. M. Lacerda compares the Botocudos of the Sambaquis (Brazilian Kjökkenmödding) of the south with those of the Rio Doce and discovers curious affinities between the two types and the man of Lagoa Santa. M. Peixoto concludes that no type yet examined in Brazil presents the essential characters of a race. It appears that a great mixing has long been going on among South American populations. The plastic forms of the primordial

elements, factors in the mixture, have long ago disappeared in the general fusion.

M. Netto's contribution occupies more than half of the volume and is rich in material for future study.

The first subject considered by M. Netto is the Mound of Pacoval, on the borders of Lake Arary, a hillock in form of a tortoise, a national necropolis wherein a whole nation buried their treasures with their dead. Here were found vast deposits of ornamental pottery. One of the interesting and useful characteristics of this people was the symbolical representation of the human head, which the author of the paper regards as portraitures of the people. Many pages of the memoir are occupied with the description of the markings on this pottery.

Among the works of the mound-builders of the Amazon are innumerable characteristics which recall the works of mound-builders of the Mississippi valley as well as those of the civilized peoples further south. Through much of M. Netto's comparative work we are unable to find our way, lacking the material, but every archæologist will be delighted with his figures and descriptions of stone implements. The existence of nephrite specimens among the objects from the shell-heaps and mounds is another confirmation of the belief that all implements of this material found in America are of American origin.

MANUFACTURE OF BOWS AND ARROWS AMONG THE NATANO (HUPA) AND KENUCK (KLAMATH) INDIANS.—The bow-makers of both these tribes are specialists, and the trade is now confined to a very few old men. I have here seen no man under forty years of age that could make a bow or an arrow, and only one old man who could make a stone arrow-head.

To make a bow, the wood of a yew sapling two and a half to three inches in diameter is selected and rough hewn to shape, the heart side inward and the back carefully smoothed to the form of the back of the bow. The sinew is laid on while the wood is green, and held in place until dry by means of a twine wrapping. In this condition it is hung in the sweat house until the wood is thoroughly seasoned, when it is finished and strung, and in some cases the back varnished and painted. The most delicate part of the operation is to get the proper tension on the sinew backing. If too tight the wood crimps or splinters when the bow is strung, and a lack of proper tension leaves the bow weak and worthless. When the bow is seasoned it has a reverse curve of about three inches.

The sinew for the backing and bow-string is taken from the back and the hind leg of the deer at the time of killing, and dried for future use. When required it is soaked until pliable, stripped into fine shreds and laid on by commencing at each end and ter-

minating at the center of the bow. The sinew is slightly twisted and dried before it is placed on the bow.

The glue used to fix the backing is obtained by boiling the gland of the lower jaw and the nose of the sturgeon. This is dried in balls and preserved for use, and is prepared by simply dipping it in warm water and rubbing it on the wood.

The arrow shafts are usually made from the wood of the wild currant, and are worked to shape with a knife and tried by the eye. After roughing they are allowed to season and are then finished. Any curves are taken out with a straightener, made of a piece of hard wood, spindle-shaped and perforated in the middle. The arrow-heads used in war and for big game are usually made from flint and obsidian, and more recently of iron and steel. The flakes for the stone heads are knocked off by means of a pitching tool of deer antler. The stone heads are made with a chipper composed of a crooked handle to which is lashed a short piece of antler precisely similar to those which I collected at Pt. Barrow. The work is held in the left hand on a pad and flaked off by pressure with the tool in the right hand in exactly the same manner as I found the Innuits doing in Northern Alaska.

The bows made by these people are effective for game up to fifty or seventy-five yards, and would inflict a serious wound at one hundred yards. At fifty yards the arrows will penetrate a deer from five to ten inches. I never heard of one passing entirely through a deer. The elk-skin armor which I sent to the museum (Nos. 120 and 121) is proof against any arrow.—*P. H. Ray.*

Californian and Polynesian Fish-hooks.—In his work on prehistoric fishing in Europe and North America, Dr. Rau has drawn attention to the similarity of South Californian and Polynesian fish-hooks of shell and bone, and he has figured a few from South Sea islands for the sake of comparison. In consequence thereof he received, unasked, a short time ago, from the ethnological department of the British Museum a communication together with a large plate of drawings of Polynesian fish-hooks preserved in the museum. Some of these are strikingly alike the Californian specimens; not only does the curved points in these hooks approach very closely the shank, but they also show, like the California hooks, a barb on the outside. This analogy is the more significant, as some ethnologists, Dr. Charles Pickering among them, have claimed a relationship between the Polynesians and South Californians.

Another interesting connecting link between these two regions is a collection of shell necklaces from Talamanca, Costa Rica, made from the apex whorls of Oliva, and ground down on the string similarly to those Penrhyn and Kingsmill islands described by Mr. Horatio Hale.

ANCIENT EGYPTIAN CLASSIFICATION OF THE RACES OF MAN.—At a meeting of the London Anthropological Institute, held May 25th, Mr. R. S. Poole read a paper, reported in *Nature*, on the "Ancient Egyptian Classification of the Races of Man." This was defined by the famous subject of the four races in the tombs of the kings, at Thebes (B. C. 1400—1200). The types were (1) Egyptian, red; (2) Shemite, yellow; (3) Libyan, white; (4) Negro, black. By comparison with monuments of the same period and of a somewhat earlier date, the first race, clearly an intermediate type, was seen to comprehend the Phenicians, the Egyptians and the people of Arabia Felix with the opposite coast. The Libyan race included an aquiline type, with marked supraorbital ridges and receding foreheads, as well as a straight-nosed type. These two types inhabited the south coast of the Mediterranean and some of the islands. The Negro race included the Negro and Nubian types. The Hittites and Hyksos, or shepherds, were as yet unclassed. Professor Flower remarked upon the resemblance of the aquiline Libyan type to that of the Neanderthal crania and the oldest European type; and saw in the Hyksos head distinctly Mongolian characters. These two points are of the highest consequence in historical anthropology.

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SCIENTIFIC NEWS.[1]

— A new society, known as the Lackawanna Institute of History and Science, has been organized at Scranton, Pennsylvania. It starts off with the remarkable number of six hundred charter members, including the names of most of the prominent men and women of the Lackawanna valley. In June and July a summer school of geology was carried on under the auspices of the society, and conducted by Professor John C. Branner, of the Indiana University. The interest manifested in this class is a promise of what may be expected hereafter of the society, in the way of interesting its younger members in active work. The class numbered forty regularly enrolled members, while on some days the excursions in the field numbered nearly twice as many. Lectures upon the geology of the region were delivered every alternate evening to full houses. A lecture was also delivered by Professor W. R. Dudley, of Cornell University, upon the geographical distribution of plants.

Scranton is certainly well located for such work. To the south and within easy reach, the rocks are exposed all the way from the bottom of the Upper Silurian at the Delaware water gap to and through the coal measures of the Lackawanna valley. The mountainous region, fine scenery and extremely interesting geology and botany mark the place as an extraordinarily favorable

[1] Edited by WM. HOSEA BALLOU, 265 Broadway, New York.

one for such classes. Hitherto Scranton, now a city of over 80,000 inhabitant, has devoted itself to material development, and has succeeded. We now expect to see as marked success of a higher order. It makes a good beginning.

— The Scientific Association of Detroit is not active. It has donated its valuable collections to the city, which has provided the specimens with scant but pleasant apartments in the public library buildings. Detroit is a city of millionaires. Michigan is a State of boundless mineral wealth, rich in industrial woods and remarkable geological formations, and the home of ancient hieroglyphics and ethnological remains. That scientific apathy should reign in Detroit where a large body of citizens have made millions from these resources, is at least a State disgrace. Detroit ought to support a museum devoted to the resources of the commonwealth of which it is the metropolis, especially as it is one of the oldest cities of America.

— The meteor which fell near Claysville, Washington county, Pa., September 14th, was found recently by Professor J. Emerick, of William and Mary College. The stone was found embedded at the base of a hill. It weighed about 200 tons, but was cracked into pieces by contact with a stratum of limestone. Its composition was chromium, nickel, aluminium, copper, magnesium, tin and other metals and metalloids. It contained eighty-seven per cent of iron in a metallic state. Its specific gravity was 7412. Its elevation above the earth's surface was established at fifty-two miles, its path nearly horizontal, its flight between five and ten seconds, its visible path 150 miles, and its velocity fifteen to twenty miles per second.

— The Chicago Academy of Sciences has been presented with the bones of an elephant supposed to be *Elephas primigenius*, by Dr. E. W. Andrews. The remains were discovered in the eastern part of Washington Territory. Among them is one animal of enormous size which is quite as large as Ward's Siberian Mammoth. Its tusk is ten feet in length, pelvis sixty-three inches in length and the longest rib found 54.6 inches long. No complete skeleton was found.

— Professor H. S. Carhart, of the Chair of Physics of the Northwestern University at Evanston, has been called to the similar chair at Ann Arbor. Professor Carhart has now a high standing as a physical experimentalist, both as regards America and Germany.

— Dr. Oliver Marcy, LL.D., has issued the annual report of the museum of the Northwestern University, at Evanston, Ill., which shows it to be one of the very first in standing west of the Alleghenies. The donations of the year are exceedingly numerous and valuable.

— The only photograph that was taken of William B. Carpenter, C.B., M.D., LL.D., F.R.S., during his late visit to the U. S., when he came to attend the A. A. A. S., measures 11 × 17 in., and copies can be obtained of Mr. Charles Slosson, 181 Hudson street, Buffalo, N. Y.

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PROCEEDINGS OF SCIENTIFIC SOCIETIES.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—This body met at Buffalo, N. Y., commencing August 18th, in the building of the municipal High School. The following papers were read:

Thursday, August 19th.

SECTION E—GEOLOGY AND GEOGRAPHY.

On the methods of testing building stones by absorption, freezing and fire. Alexis A. Julien.

Thickness of the glacier in N. E. Penn. John C. Branner.

A remarkable extinct geyser basin in S. W. Colorado. Theo. B. Comstock.

The Tully limestone; its distribution, character and fossils. S. G. Williams.

Note on the Lower Helderberg rocks of Cayuga county, N. Y. S. G. Williams.

Revision of the Cayuga Lake section of the Devonian. H. G. Williams.

Mechanical origin of the Triassic monoclinal in the Conn. valley. W. M. Davis.

Remarks on molluscan fossils of the New Jersey marl beds, contained in Vols. I and II of the New Jersey palæontology, and on their stratigraphical relations. R. P. Whitfield.

Preliminary geological map of Nebraska. L. E. Hicks.

The Permian formation in Nebraska. L. E. Hicks.

Some typical well-sections in Nebraska. L. E. Hicks.

The Lincoln salt-basin. L. E. Hicks.

On Devonian and Carboniferous fishes. J. S. Newberry.

On the Cretaceous flora of N. America. J. S. Newberry.

On some Carboniferous wood from Ohio. E. W. Claypole.

On the deep well at Akron, Ohio. E. W. Claypole.

Notes on the Archæan rocks of the highlands east of the Hudson river in New in New York. J. C. Smock.

Some new geologic wrinkles. G. K. Gilbert.

Rounded boulders at high altitudes along some Appalachian rivers. I. C. White.

Topography of head of Chesapeake bay. W. J. McGee.

Quaternary geology of the head of Chesapeake bay. W. J. McGee.

Cambrian age of the roofing slates of Granville, Washington county, New York. C. D. Wolcott.

Super-metamorphism; its actuality, inducing causes and general effects. T. B. Comstock.

Paper on geology of Florida. J. Kost.

SECTION F—BIOLOGY.

Atavism the result of cross-breeding lettuce. E. Lewis Sturtevant.

The bulliform or hygroscopic cells of grasses and sedges compared. W. J. Beal.

Synopsis of North American pines based on leaf anatomy. John M. Coulter and J. N. Rose.

The development of the Gymnosporangia of the United States. W. G. Farlow.

Plan for laboratory work in chemical botany. Lillie J. Martin.

A study in agricultural botany. E. Lewis Sturtevant.

Biology of timber trees with special reference to the requirements of forestry. B. E. Fernow.

Immunity from contagious diseases produced by products of bacterial multiplication. D. E. Salmon.

SECTION H—ANTHROPOLOGY.

A query as to the sepulchral rites of the mound-builders. Edward P. Vining.

Notes upon a native Brazilian language. J. C. Branner.

The phonetic elements in the graphic system of the Mayas and Mexicans. D. G. Brinton.

Wampum. W. M. Beauchamp.

Piute herbalist. Chas. P. Hart.

Eyah Shah, a sacrificial stone of the Dakotas. Horace C. Hovey.

Characteristic curves of composition. T. C. Mendenhall.

The origin and antiquity of the New York Iroquois. W. M. Beauchamp.

On gold and silver ornaments from Florida. Geo. F. Kunz.

Gold ornaments from the United States of Colombia. Geo. F. Kunz.

Longevity of great men. Joseph Jastrow.

The department of Chiriqui; its potteries, stone and metal implements. Wolfred Nelson.

In the afternoon, at 3 o'clock, an excursion down the Niagara river to Grand island was given by invitation of the local committee.

In the evening the Botanical Club of Buffalo received the Botanical Club of the association, at the residence of Hon. David F. Day, 69 Cottage street, at 8 o'clock.

Friday August 20th.

SECTION E—GEOLOGY AND GEOGRAPHY.

The Niagara gorge. J. Pohlman.

On the rate of recession of the Niagara falls. R. S. Woodward.

Buffalo and Chicago, or what might have been. E. W. Claypole.

The place of Niagara falls in geologic history. G. K. Gilbert.

Some new terrestrial facts bearing on the date of the close of the last glacial period. G. F. Wright.

SECTION F—BIOLOGY.

On the development of the human chorion. Chas. S. Minot.

The theory of immunity from contagious diseases. D. E. Salmon.

The presence and relations of the corpus callosum in the brains of the lower vertebrates. Henry F. Osborn.

Human cerebral fissures: their relations and names, and the methods of studying them. Burt G. Wilder.

The lampreys of Cayuga lake. S. H. Gage and Seth E. Meek.

Vaso motor nerves of the limbs. H. P. Bowditch.

On areas of form and color perception in the human retina. J. H. Pillsbury.

The facial nerve in the domestic cat. T. B. Stowell.

Homologies of segmentation of the ovum in vertebrates. C. S. Minot.

Demonstration of an easy method of measuring reaction-times. Jos. Jastrow.

Relative stability of organs as dependent on phylogeny. Frank Baker.

SECTION H—ANTHROPOLOGY.

Ancient art in Chiriqui. John A. McNeil.

Torsion of the humerus in North American Indians. Frank Baker.

Additional observations on ancient methods of arrow release. Edw. S. Morse.

Child mind. Geo. M. Maxwell.

In the afternoon the Entomological Club made an excursion to Ebenezer in company with the home club.

After the adjournment of the sections Mrs. Bronson C. Rumsey received the members of the association at a lawn party, at her residence on Delaware avenue, from 4 to 6 o'clock.

In the evening Mr. Edward Atkinson, of Boston, delivered a lecture in Liedertafel hall, at 8 o'clock, on "The Relative Weakness and Strength of Nations."

Monday, August 23d.

SECTION E—GEOLOGY AND GEOGRAPHY.

The age and cause of the gorges cut through the trap ridge by the Conn. river. B. K. Emerson.

Fossils from the Taconic. J. D. Dana.

Palæontological observations on the Taconic limestones of Canaan, Columbia county, N. Y. W. B. Dwight.

The criticisms of the anticlinal theory of natural gas. I. C. White.

A periodic tidal wave as a geologic agent. J. C. Branner.

Description of a new crustacean from the Clinton group of Georgia. A. W. Vogdes.

The Strophomenidæ, a palæontological study of the imitation of genera and species. H. S. Williams.

On certain limestones of Columbia county, N. Y. I. C. Bishop.

Some questions relating to the subcarboniferous conglomerates. J. C. Branner.

A trilobite track illustrating the mode of progression of the trilobite. N. S. Ringueberg.

Hints towards a theory of vulcanism. T. B. Comstock.

Drift of the Rocky mountains. T. B. Comstock.

The Holyoke range on the Connecticut. B. K. Emerson.

SECTION F—BIOLOGY.

Memoranda of a revision of the North American violets. Asa Gray.

A revision of the North American species of the genus Fissidens. C. R. Barnes.

On the variability of pathogenic organisms, as illustrated by the bacterium of swine plague. Theobald Smith.

A point of priority in regard to the theory of immunity from contagious diseases. D. E. Salmon.

The bacterium of swine plague. D. E. Salmon and Theobald Smith.

On some contagious diseases of insects. S. A. Forbes.

Physiological notes on ants. Joseph Jastrow.

Orientation of small objects for section-cutting. J. S. Kingsley.

Embryology of Crangon. J. S. Kingsley.

The dreams of the blind and the centers of sight. Joseph Jastrow.

Work of the U. S. Department of Agriculture in economic ornithology and mammalogy. C. Hart Merriam.

Do any of our North American bats migrate? Evidence in the affirmative. C. Hart Merriam.

Traveling of the larva of a species of Sarcophaga. W. L. Coffinberry.

The prototype of the Cephalopoda. Alpheus Hyatt.

SECTION H—ANTHROPOLOGY.

An Indian secret society. J. Owen Dorsey.

Ancient fortifications in the Ohio valley. Geo. M. Maxwell.

The way bone fish-hooks were made. F. W. Putnam.

Self-evident limits regarding a knowledge of the origin of languages. John Müller.

Tuesday, August 24th.

SECTION E—GEOLOGY AND GEOGRAPHY.

Notice of geological investigations along the eastern shore of Lake Champlain conducted by Professor H. M. Seely and President Edward Brainard, of Middlebury College, with descriptions of the new fossils discovered. R. P. Whitfield.

Remarkable impressions on syenite. W. H. Pitt.

Veins of S. W. Colorado. T. B. Comstock.

On some dynamic effects of the ice sheet. F. J. H. Merrill.

The petrified forest of Alabama. J. Dickenson.

Remarkable occurrence of rock crystal in the U. S. G. F. Kunz.

Some new terrestrial facts bearing on the date of the close of the last glacial period. G. F. Wright.

SECTION F—BIOLOGY.

The homologies of the ear-bones in certain of the lower Vertebrata. E. D. Cope.

Note on the crystalline style in *Mya arenaria*. Fanny R. Hitchcock.

Zoetic maxima. L. P. Gratacap.

Osphradium in Crepidula. Henry L. Osborn.

SECTION H—ANTHROPOLOGY.

Some facts indicating a greater antiquity for the ancient Chiricaños than is generally conceded. J. A. McNiel.

Some notes on the possibility of the recalcification of the human teeth. J. R. Walker.

Uses of the terms grandfather and grandmother among the Siouan tribes. J. Owen Dorsey.

Preliminary note on the analysis of the Mexican inscriptions and codices. Zelia Nuttall Pinart.

The diversity of the mounds and earthworks of the United States. F. W. Putnam.

The Maori of New Zealand as compared with other members of the Polynesian group. John Müller.

The salt kettles and pans of the mound-builders. W. McAdams.

An old copper kettle of Spanish origin from a mound in Illinois. W. McAdams.

The testimony of some recently explored mounds. Cyrus Thomas.

The following officers were elected for the next meeting: President, S. P. Langley, of Allegheny, Pa.; vice-presidents, A. Mathematics and astronomy, Wm. Ferrel, of Washington, D. C.; B. Physics, Wm. A. Anthony, of Ithaca, N. Y.; C. Chemistry, Albert B. Prescott, of Ann Arbor, Mich.; D. Mechanical science and engineering, Eckley B. Coxe, of Drifton, Pa.; E. Geology and geography, G. K. Gilbert, of Washington, D. C.; F. Biology, W. G. Farlow, of Cambridge, Mass.; H. Anthropology,

D. G. Brinton, of Media, Pa.; I. Economic science and statistics, Henry E. Alvord, of Amherst, Mass.

Permanent secretary, F. W. Putnam, of Cambridge, Mass.; general secretary, W. H. Pettee, of Ann Arbor, Mich., assistant general secretary, J. C. Arthur, of Geneva, N. Y.

Secretaries of the sections: A. Mathematics and astronomy, Henry M. Paul, of Washington, D. C.; B. Physics, C. Leo Mees, of Athens, Ohio; C. Chemistry, C. F. Mayberry, of Cleveland, Ohio; D. Mechanical science and engineering, Geo. M. Bond, of Hartford, Conn.; E. Geology and Geography, T. B. Comstock, of Champaign, Ill.; F. Biology, J. Henry Comstock of Ithaca, N. Y.; H. Anthropology, F. W. Langdon, of Cincinnati, Ohio; I. Economic science and statistics, Wm. R. Lazenby, of Columbus, Ohio.

Treasurer, William Lilly, of Mauch Chunk, Pa.

Meetings of the Botanical Club and the Entomological Club were held during the week in the High School.

The meetings of the Botanical Club were held at 9 A. M. on Wednesday, Thursday, Friday, Monday and Tuesday, at the room of the Biological Section, in the High School, and at such other hours as announced in the daily programme.

Two excursions were given by the local committee to the members of the association. One to Niagara falls via New York Central railroad. Dinner was provided by the local committee at the International hotel, Niagara falls. Arrangements for reduced rates were made with Mr. Alva Gluck, the proprietor of the "International."

The other excursion was to Chautauqua lake via Buffalo, New York and Philadelphia railroad to Maysville, from Maysville to Bemus point by steamer, where dinner was served.

The number of papers presented was 263. The number of members in attendance was 442. The number of new members elected was 142.